The US Army's Center for Strategy and Force Evaluation

STUDY REPORT
CAA-SR-94-8

FINDING AN OPTIMAL STATIONING POLICY FOR THE UNITED STATES ARMY IN EUROPE AFTER THE FORCE DRAWDOWN (FUSSPRINT)

DECEMBER 1994

PREPARED BY
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With the continuing reduction of forces in Europe, it is apparent that the base support structure cannot be maintained at current levels. The purpose of this effort is to develop a methodology to assign US Army units remaining in Europe to installations in an economical manner and to make recommendations regarding which installations are candidates for deactivation and closure. An integer programming model has been formulated which minimizes annual costs subject to contraints on required resources, one-time implementation costs, unit proximity, and support requirements. The model can be used to provide decisionmakers with insights regarding resource utilization and shortfalls and costs of implementing various stationing plan alternatives. Model development and data collection issues are discussed. Computational experience is given, and efforts to improve model performance are described.

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STUDY REPORT
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FUTURE USAREUR SITE SELECTION PROGRAM FOR REDUCTION IN TROOPS (FUSSPRINT)

December 1994

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REPLY TO
ATTENTION OF:

10 JUL 1995

CSCA-RSV (5-5d)

MEMORANDUM FOR Deputy Commander in Chief, US Army Europe and Seventh Army, APO AE 09014

SUBJECT: Future USAREUR Site Selection Program for Reduction in Troops (FUSSPRINT) Study

1. Reference.

a. Letter, AEADC, 20 December 1992, subject: Study Directive Future USAREUR Site Selection Program for Reduction in Troops; short title: FUSSPRINT

b. Letter, DACS-DMO, 19 October 1983, subject: Responsibilities of Study Performing and Study Sponsoring Organizations.

2. The Deputy Commander in Chief, US Army Europe and Seventh Army, requested that the U.S. Army Concepts Analysis Agency (CAA) provide stationing recommendations for a USAREUR force of 65,000.

3. This final report documents the results of our analyses.

4. This Agency expresses appreciation to all commands and agencies which have contributed to this study. Questions and/or inquiries should be directed to the Chief, Value Added Analysis Division, U.S. Army Concepts Analysis Agency, 8120 Woodmont Avenue, Bethesda, MD 20814-2797, DSN 295-1609.

Daniel [illegible]
for E. B. VANDIVER III
Director

CAA	FUTURE USAREUR SITE SELECTION PROGRAM FOR REDUCTION IN TROOPS (FUSSPRINT)	STUDY SUMMARY CAA-SR-94-8

THE REASON FOR PERFORMING THE STUDY was to support the Deputy Commander in Chief, US Army Europe and Seventh Army (DCINC USAREUR) in making unit restationing and community closure decisions necessitated by a force reduction of approximately 148,000 soldiers.

THE STUDY SPONSOR was the DCINC USAREUR, who established the study objective and monitored the study activity.

THE STUDY OBJECTIVE was to develop a tool to support US Army Europe (USAREUR) restationing decisions resulting from the force drawdown.

THE SCOPE OF THE STUDY encompassed assigning all USAREUR units to be stationed in Germany (approximately78 percent of the total USAREUR end strength). Units were assigned to the community level. Communities to be considered were specified by the sponsor.

THE MAIN ASSUMPTION of this work is that the proper stationing of units can be modeled by considering: a unit's proximity to its higher headquarters and other units, a unit's utilization of certain resources, the availability of certain resources in a community, and a limited set of possible locations for each unit.

THE BASIC APPROACH used in this study was to:

(1) Identify the data needs associated with restationing and community closure issues.

(2) Develop a pure 0-1 integer program model to use as a decision support tool

(3) Demonstrate the methodology using the 65,000 force structure.

(4) Provide stationing and closure recommendations to the sponsor and improve the model based upon sponsor feedback.

THE PRINCIPAL FINDING of this work is that the FUSSPRINT methodology can be used to make insightful restationing and closure recommendations that could save money; the results are limited by the quality and quantity of data available on community resources and unit requirements.

THE STUDY EFFORT was directed by LTC Andrew G. Loerch, Value Added Analysis Division, US Army Concepts Analysis Agency (CAA).

COMMENTS AND QUESTIONS may be sent to the Director, US Army Concepts Analysis Agency, ATTN: CSCA-RSV, 8120 Woodmont Avenue, Bethesda, Maryland 20814-2797.

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CHAPTER 1

EXECUTIVE SUMMARY

1-1. PROBLEM. The problem is to determine efficient stationing solutions for a USAREUR force of 65,000 soldiers. Efficient solutions minimize stationing costs while meeting a unit's stationing requirements. This study has developed a methodology to answer the questions: Where should each unit be located? What communities should be utilized to house the force?

1-2. BACKGROUND

a. The end of the Cold War caused the National Military Strategy to change from containment to power projection. President Clinton has stated, "My administration will make security and savings compatible. We will reduce our forces, but maintain a credible presence in Europe and Asia and make reductions in consultation with our allies. We will stand up for our interests, but we will share burdens, where possible, through multilateral efforts to secure the peace, such as NATO."

b. Correspondingly, USAREUR's roles and missions have changed to include contingency operations, peacekeeping, and humanitarian assistance. USAREUR's force structure is decreasing accordingly from 213,000 to an end strength force of 65,000.

c. Effective restationing of the force must incorporate the following guidance from the USAREUR Commander in Chief:

(1) Get out of the worst installations.

(2) Retain the best quality-of-life facilities.

(3) Retain local training areas.

(4) Protect major training areas at Hohenfels and Grafenwoehr.

(5) Keep needed government housing within commuting distance.

(6) Get out of cities and urban congestion.

(7) Move a unit only once.

1-3. SCOPE

a. This effort considers only USAREUR units to be located in Germany, approximately 78 percent of the total USAREUR end state force. Southern European Task Force (SETAF) units and non USAREUR units stationed in Germany (stovepipes) were not included in this phase. The study methodology can be used to consider all USAREUR units in an expanded effort.

b. Units were assigned to the community level. Communities to be considered were specified by the sponsor.

1-4. AGGREGATION

a. In its natural form, this problem is one of the largest of its kind ever solved; it involves assigning 1,192 separate units to 302 installations. Formulated as an integer program, this problem exceeds the size of problems that can be solved with state-of-the-art technology.

b. This problem is addressed by decreasing the number of solution possibilities that a computer must examine; 1,192 units are reduced to 235 by aggregating to an appropriate level of resolution. For example, an artillery battalion is modeled versus five separate batteries. The 302 separate installations are represented as 21 communities/base support battalions (BSB). All of the installations under the BSB's control are represented under the name of that BSB. Each installation's resources are rolled up and captured at the BSB level.

1-5. LIMITATIONS. This study was limited by the unavailability and/or inaccuracy of data. Better data is required on community resources (family housing, administrative space, motor pool capacity, etc...), resource requirements and authorizations for USAREUR units, and actual budget and spending data for BSBs in order to expand this effort into an active decision support tool.

1-6. TIMEFRAME. The USAREUR force onhand as of 1 January 1992 and the force projected to be onhand as of 1 December 1995 is considered.

1-7. KEY ASSUMPTIONS

a. Assignments are made based on the following:

(1) A unit's proximity to its higher headquarters and other units,

(2) A unit's utilization of certain resources,

(3) The availability of certain resources in a community,

(4) How a unit provides support,

(5) Command decisions,

(6) Segregation of the 1AD and the 3ID.

b. Installation resources are aggregated to community level.

c. Units are assigned to the community level.

d. Assignments are limited by resource availability.

e. Some units can be aggregated up to a higher level.

1-8. METHODOLOGY

a. Identify the data needs associated with restationing and community closure issues.

b. Develop a pure 0-1 integer program model to use as a decision support tool. This tool is to minimize annual stationing costs subject to constraints on one-time investment costs, unit proximity, and resource utilization.

c. Demonstrate the methodology using the 65,000 force structure.

d. Provide stationing and closure recommendations to the sponsor and improve the model based upon sponsor feedback.

1-9. ESSENTIAL ELEMENTS OF ANALYSIS

a. **Does the methodology station units effectively?** Yes, given that assignments can be based upon the issues stated in paragraph 1-7a. Undoubtedly other important points affect stationing decisions, but this analysis must be limited to considering those points that lend themselves to mathematical modeling.

b. **Where should each unit be stationed?** See Appendix E for a representative unit to community stationing solution.

c. **What set of communities should be used to station the force?**

(1) The study sponsor specified that this effort consider the same set of 22 communities being proposed by the USAREUR DCSOPS CFE staff. Analysis using the FUSSPRINT methodology indicates that this set of communities provides for an efficient and effective stationing solution. When the set of communities considered is specified, only marginal improvements to the DCSOPS CFE proposal can be achieved using the FUSSPRINT methodology.

(2) The FUSSPRINT methodology has the ability to consider any set of communities. Data must be available on the resources of interest (family housing, administrative space, motor pool space, etc....) in communities to be considered.

(3) Figure 5-1, Chapter 5, shows the 21 communities used to station the force.

d. **What are the minimum annual and one-time costs to station the force?** Based on budget data provided by the USAREUR Operations Research and Systems Analysis (ORSA) Cell, the best solution developed has an annual cost of $363 million and a one-time cost of $142 million. These budget numbers are contentious; personnel from USAREUR Deputy Chief of Staff for Resource Management (DCSRM) and USAREUR ORSA disagree on the details. The best budget data available at the time was used. What's important about these numbers is that costs can be incorporated into the analysis and used to compare stationing courses of action.

1-10. KEY FINDINGS

a. The FUSSPRINT methodology can be used to make insightful restationing and closure recommendations that could save money.

b. Improved data on resource availability, resource usage, and BSB budget information will enhance the quality of the results provided by the FUSSPRINT methodology.

c. The FUSSPRINT methodology can be used for future analysis of USAREUR stationing issues.

d. The methodology and supporting model proved to be well suited for efficiently evaluating stationing alternatives and for developing superior plans.

e. The study effort produced the capability for effectively and responsively evaluating comprehensive unit stationing alternatives in USAREUR and should measurably enhance the success of this key mission planning function. The results will likely have a long-lasting beneficial impact on the disposition of troops in Europe.

f. The evolution and application of the expertise, techniques, and tools brought to bear on solving this problem advanced the Army's capability for solving these types of unique and complex military problems.

CHAPTER 2

INTRODUCTION

2-1. OVERVIEW

a. This chapter discusses the background for conducting the FUSSPRINT Study, the broad elements of the restructured USAREUR stationing problem, and evolution of the study approach and methodology. Certain aspects of the magnitude and complexity of the study are highlighted due to the unprecedented size and scope of the problem and the application of advanced analytical techniques and software programs specifically developed and refined for addressing this and similar military problems. In addition to producing alternative solutions for consideration in making USAREUR force stationing and base realignment plans, the study effort is notable in that it represents a major milestone in the development and application of powerful analytical techniques suitable for addressing unusually complex military problems.

b. The FUSSPRINT Study was undertaken to provide decision support analysis and to assist USAREUR in developing detailed plans for unit stationing, installation and community realignment, and closure actions. The study focused on developing a methodology and mathematical model for producing superior stationing solutions based on the application of specified policy decision criteria.

2-2. BACKGROUND

a. Since the end of World War II, the US Army has maintained a significant forward-deployed force on the continent of Europe. The principal mission of this force was to deter aggression by the Union of Soviet Socialist Republics and to defend western Europe from attack until adequate reinforcements arrived to defeat the attackers.

b. For most of this "Cold War" period, the US Army in Europe consisted of two full army corps, the Fifth and the Seventh Corps, a full logistical support command, the 21st Theater Army Area Command, and numerous other units and organizations that served various functions. Altogether, 213,000 soldiers were stationed in Europe during the Cold War period.

c. In 1990, the Conventional Armed Forces Europe (CFE) Agreement with the Soviet Union was implemented. This agreement signaled the beginning of a programmed bilateral drawdown of US and Soviet troop strengths in Europe. The subsequent collapse of the Soviet Union in 1991 vastly reduced the perceived threat to the security of western Europe, as well as to the national interests of the United States, and ended the Cold War era. Consequently, the need to continue expending large sums to maintain a powerful European presence was called into question. National Military Strategy shifted from containment in Europe by large forward-deployed forces to deterrence with a forward presence supported by the capability to mobilize, reconstitute, and deploy. Programmed reductions in troop strengths were accelerated. Ultimately, the decision was made to leave 65,000 soldiers stationed in Europe.

2-3. PROBLEM

a. It was immediately apparent that the base support structure that existed for stationing 213,000 troops was no longer necessary for the units that would remain. One of the fundamental problems which ensued from such a large force drawdown was that of determining an overall stationing plan for the remaining forces. Since the locations of existing bases corresponded largely to where American forces ceased operations at the end of World War II, no particular pattern existed that would suggest a schema for developing a stationing plan for the remaining units.

Clearly, just leaving the remaining units at their current locations would not only be inefficient in terms of resources, but may also present poor logistical and command and control situations.

b. An organization known as the Conventional Armed Forces Europe (CFE) Cell was formed in the headquarters of the US Army in Europe to develop an integrated stationing plan for the remaining units. In performing this task, they were directed by CINC USAREUR to consider, among others, the following factors: costs, both annual and one-time expenditures; quality of life of the soldiers and their families; and the accomplishment of unit missions. These factors, which are discussed in detail in Chapter 3, were often hard to measure and frequently conflicted. As such, the development of the plan presented an exceedingly complex undertaking.

c. As the drawdown of troops occurred, the CFE Cell developed several stationing plans. In developing these plans, members of the cell made numerous site visits, interviewed hundreds of individuals that were knowledgeable of the various aspects of the stationing requirements, and conducted iterative analyses. This process was both time-consuming and manpower-intensive. It was not responsive to change and made tradeoff analysis difficult. It was concluded that additional analytical support capability would be helpful in evaluating alternatives and formulating recommendations and plans for base closings, consolidations, and restationing actions.

d. In order to speed the process of evaluating and developing alternative stationing plans the US Army Concepts Analysis Agency (CAA) was asked to develop a methodology for evaluating and producing stationing alternatives. These alternatives would serve as starting points for the CFE Cell planning and could be used to evaluate tradeoffs among alternatives.

2-4. METHODOLOGY

a. The unusually large, unique, and complex nature of the problem dictated the need for a tailored and sophisticated mathematical modeling approach to handle the huge volume of data and provide the required analytical capability. CAA used CINC USAREUR reduction policy criteria in conjunction with other evaluative data elements such as unit sizes, equipment considerations, support requirements, and geographic proximity of headquarters and support elements to structure a framework for modeling the problem, conducting the analysis, and developing suitable alternatives. An extensive collection effort by USAREUR, United States Military Academy (USMA), and CAA personnel was required to obtain the evaluative data needed for modeling the problem.

b. An integer programming model was formulated to represent the problem, evaluate key input data, and produce comparative results which would serve USAREUR decisionmaking and planning needs. The model logic was designed to achieve the desired objectives of minimizing recurring and one-time costs, maintaining unit integrity and proximity, and fulfilling unit support requirements. Model results were structured to provide decisionmakers with insights regarding the resource impacts associated with implementing a range of suitable and noticeably unsuitable stationing plan alternatives. Uneconomical or otherwise unfavorable alternatives would be exposed and superior stationing alternatives could be readily identified.

c. Model results were provided to USAREUR as a basis for developing stationing plans. Subsequently developed USAREUR plans could be run in the model for postdevelopment or iterative evaluation and refinement, as may be needed.

2-5. SUMMARY. This chapter provided an overview of the work done to assist in restationing the USAREUR force structure. Chapter 3 discusses the study methodology in depth, Chapter 4 explains the implementation issues, and Chapter 5 summarizes the results achieved.

CHAPTER 3

METHODOLOGY

3-1. GENERAL. This chapter addresses the various aspects of the model building process. Section I is a discussion of issues that were considered and that were built into the FUSSPRINT model. Section II talks to the problem formulation in detail, and Section III addresses the important issue of stationing support units effectively.

Section I. MODELING CONSIDERATIONS

3-2. GENERAL MODELING CONSIDERATIONS. Several factors came into play in the development of a stationing methodology. These factors are discussed in this section, and a framework for CAA's modeling effort is provided.

3-3. COSTS

a. **Annual Stationing Costs**. The first factor that was to be considered was cost. Through discussions with the study sponsor, it was determined that the overriding consideration must be the annual cost of the stationing plan. Since the funds needed to station units at a particular location come from the same appropriation from which operating and training funds come, any savings realized can be used to increase the combat readiness of the force. Thus, the importance of limiting the expenditure of these funds to a minimum level is paramount, and cost minimization becomes the objective of the optimization model. There are two parts of these annual stationing costs that are important to the process of building a stationing plan. They are the overhead cost of having the installation open, regardless of how many units are stationed there, and the cost of stationing individual units at particular locations.

(1) **Overhead Costs.** The overhead costs were computed based on historical records. These costs were estimated by applying per capita cost factors representing the total base operations costs of the parent area support group (ASG) to the base support battalion (BSB) number of personnel. The source of the ASG per capita cost factors was the 1 October 1992 USAREUR Factors Handbook (USAREUR Circular 37-11).[1]

(2) **Unit Stationing Costs.** Unit stationing costs were estimated based on the type of unit, the location of the installation and the "cost of living" at that location, distance of the installation from training areas, and the like. Operation and maintenance (OMA) costs came from the US Army Cost and Economic Analysis Center (CEAC) Force/Organizational Costing System (FORCES) Model. Specific unit identification codes (UICs) were matched with corresponding standard requirement codes (SRCs) from the Structure and Manpower Allocation System (SAMAS). OMA costs by SRC reflect varying tempo of operations (OPTEMPO) and indirect OMA expenditures between BSBs.

b. **One-time Costs.** Another aspect of the cost of implementing any stationing plan involved the one-time expenditure of funds to physically move units to a different location, as well

as the cost of shutting down an installation that is no longer needed. These costs are particularly important because they are paid from the operations and maintenance funds of the US Army, Europe. Consequently, in order to limit the adverse effect of these expenditures on readiness, they must be constrained.

(1) **Unit Movement/Transportation Costs.** The first component of these one-time costs is the cost of moving a unit from one location to another when it is restationed. This cost is a function of the number of personnel assigned to the unit, the amount of equipment the unit possesses, and the distance from one location to the other. Much of the tactical equipment assigned to the units can be moved by the unit for the cost of fuel. However, administrative equipment and the personal property of soldiers and their families have to be moved upon restationing as well. Local moving companies are contracted to perform this work. Thus, the cost of implementing the restationing of units is significant and must be estimated and accounted for in the model. Transportation costs were estimated utilizing factors from the CEAC FORCES Model. Rail costs per measurement ton (MTON) per mile and per capita bus costs per mile were respectively applied to SRC MTONs and personnel resulting in a dollar cost per mile for each SRC. MTONs for SRCs and distances between installations were obtained form the FORCES data base.

(2) **Installation Shutdown Costs.** The other significant component of the one-time costs is the expenditure required to close down installations that are no longer needed. The decision was made several years ago to enter into long-term utility contracts locally to reduce the operating costs of the installations. The expectation was that since the installations had been operating for almost 50 years, there was no reason to believe that the situation would change. Thus the cost of savings to be realized through entering long-term contracts should be pursued. In order to break these contracts at installations that are closed, a cost is incurred that must be accounted for in the decision process. Another significant cost is the severance pay for fired local national employees of the US Army. German law prescribes generous compensation for workers whose jobs are eliminated. Due to the large numbers of German, Polish, and other local national personnel employed at installations across Europe, the cost of this severance pay is potentially very high. These costs were obtained from the USAREUR ORSA Cell and were the direct result of a survey of installations.

3-4. THE COMMANDER'S REDUCTION PHILOSOPHY

a. The second factor that was to be considered involved the commander's reduction philosophy on how the drawdown was to be conducted. The Commander in Chief of the US Army, Europe (CINC USAREUR) directed that certain goals be met during the drawdown. This directive is formalized in the CINC USAREUR's Reduction Philosophy:[2]

(1) Get out of the worst installations.

(2) Retain the best quality of life facilities.

(3) Retain local training areas.

(4) Protect major training areas at Hohenfels and Grafenwoehr.

(5) Keep needed government housing within commuting distance.

(6) Get out of cities and urban congestion.

(7) Retain space to consolidate units.

(8) Minimize time between drawdown notification and departure.

Consequently, these factors must be met for any stationing plan to be considered acceptable.

b. Some of the quality of life considerations can be readily incorporated into a mathematical programming formulation. For example, the family housing requirement at an installation can be related to the number of soldiers assigned to the units located at the installation. This relationship is established by way of usage factors that were derived through the analysis of historical data.[1] Constraints can then be written such that no unit can be assigned to a location unless an adequate amount of the resource in question (in this case, family housing) is available to meet the unit requirement.

c. Other quality of life standards are not so easy to incorporate directly into the mathematical programming formulation, but can be handled instead by examining the options ahead of time to preclude violation of quality of life standards. For instance, the requirement has been established that soldiers should not live further than a 20-minute drive from a library. Almost every installation has access to a library, but some do not. Rather than attempt to constrain the distance a unit can be located from a library, preprocessing the data to preclude units from being assigned to locations that have no library simplifies the problem.

3-5. MISSION REQUIREMENTS

a. The stationing of units must be accomplished in such a way as to facilitate the accomplishment of both the combat and peacetime missions of all the Army units in Europe. Mission requirements affect the stationing of units in two ways. First, units must be located close to their area of operations. During the Cold War, each US Army unit in Europe was assigned a general defensive position, or GDP. The location of a unit's GDP was typically in close proximity to the installations at which the unit was stationed. Since the breakup of the Soviet Union, the mission of USAREUR has changed to that of contingency operations. USAREUR units must be ready to respond to a variety of contingencies, including operations outside of Europe. In Operation DESERT STORM, for example, the Seventh Corps and other USAREUR units were deployed to the Persian Gulf to participate in the war against Iraq. Thus, a premium was placed on access to transportation infrastructure: roads, rail networks, and port facilities. Units must be located in places that facilitate their rapid movement.

b. In order to maintain good command and control, especially among combat units, subordinate units need to be stationed "near" their headquarters units. The Deputy Chief of Staff for Operations and Plans (DCSOPS) CFE usually locates the battalions of a maneuver brigade

within the same community (colocation) but allows support units to be dispersed. Clearly, support units must be dispersed to perform their mission, and many valid arguments exist for colocation of maneuver units. When modeling the stationing of military units, consideration must be given to the tradeoffs between close dispersion, having subordinate units stationed in communities near their headquarters' community, and colocation. Close dispersing opens the door for possible efficiencies which colocation might prevent. Close dispersing also allows for packing units tighter into fewer communities. Allowing the battalions of a brigade to be closely dispersed among several communities in the same area is a mechanism for achieving savings; hence, close dispersion of units is allowed when applicable. From a modeling standpoint, this requirement greatly complicates the problem. Note that in a more conventional location problem,[3] facilities are sited within a given distance from one or more specified locations. This problem is more complicated because the units must be sited within a certain distance from other units, i.e., their higher headquarters, whose locations themselves are also to be determined. In subsequent sections, two different formulations to handle this aspect of the problem are discussed.

c. Some units support others and must be located so that support can be rendered efficiently and effectively. The classes of support that these units provide include maintenance, supply, personnel administration, finance, transportation, and the like. These units must be located in the proximity of the units to which the support must be given. CFE relies upon interaction with subordinate units to determine what stationing plans are feasible and desirable, i.e., give us a plan and we'll tell you how we're going to support it. Replicating this process in an optimization model has proven difficult. Key personnel from all USAREUR support unit headquarters and other knowledgeable individuals Armywide were interviewed[4-33] to determine the basis of allocation rules used by them when restationing their forces. The interviews did not produce rules or information that could be incorporated into the model. 1st Personnel Support Command was the only unit that specifically stated numerical support relationships that could be modeled. For example, a personnel support battalion can support 18,000 to 24,000 soldiers, and a personnel support detachment handles between 2,000 and 6,000, et cetera. Other units use basis of allocation rules for allocating their forces. The Provost Marshall uses numerical relationships (support to supported) to distribute the military police among communities. Unfortunately most units are not able to state the needed numerical relationships. Two recurring themes among the people involved in this process are that there is more to the support process than just numerical relationships, and subject matter experts must be involved to protect against oversimplification and inadequate support. Modeling the support units was troublesome, and the problems encountered are discussed in subsequent sections.

d. For units to be able to perform their assigned missions, sufficient resources must be made available to them. Thus, the assignment of units must be made such that the capacity of the installations with respect to resources is not exceeded. Examples of these resources include maintenance facilities, maintenance hardstand (to repair and store vehicles and equipment), aircraft operations space for aviation units, and office space for administrative activities.

3-6. AGGREGATION. The total number of units in the force structure of the US Army in Europe is 1,192. The number of individual installations used by the Army in Europe is 302. If we establish the decision to be made as the assignment of the units to the installations, in the worst case, the number of binary variables in the integer programming formulation would be 1,192 ×

302 = 359,984. In all likelihood, such a model would not be solvable. Fortunately, a great deal of aggregation is possible. The number of units is reduced to 235 and the installations are represented as 25 communities. The unit-installation combinations have been reduced to a manageable level without limiting the usefulness of the model. This aggregation is described below.

a. Aggregation of Units

(1) Many of the 1,192 Army units stationed in Europe are small teams or detachments comprised of fewer than 10 personnel and having very little in terms of vehicles and equipment. As such, these units have negligible requirements with respect to resources and space. Thus, the assumption was made that these units need not be considered explicitly in the model, and that they could be assigned to an installation afterward.

(2) Although the largest proportion of the Army units in question are stationed in Germany, many of the units are located in other European countries, including Italy, Belgium, and Greece. Since no significant plans existed to move units between countries, units stationed outside Germany are not considered here. The methodology developed here can be applied to each country as needed.

(3) Aggregation of units makes the problem less ponderous. When possible combat arms units (infantry, armor, cavalry, and artillery) are aggregated to battalion level. For example, an artillery battalion is modeled explicitly vice five separate batteries. This technique is used for combat arms units because they are normally stationed together as a battalion.

b. Aggregation of Installations

(1) Although there are 302 separate installations that the US Army utilizes in Europe, and ultimately the decision must be made as to the exact locations to which the various units are assigned, very few, if any, of the installations contain sufficient resources to support any specified unit. The installations have historically been grouped into a system of military communities. Together the grouped installations provide the needed resources for the tenant units.

(2) For example, the Wurzburg community, composed of several separate installations, was and is the home of the headquarters of the Third Infantry Division. Some of the installations are completely made up of military housing. Others contain office, operations, or maintenance space. Still others are made up of administrative space, aircraft operations space, or vehicle hardstand. None of the separate installations would be adequate to support the stationing of any of the divisional units, but together sufficient resources are available.

(3) Thus, the decision was made to aggregate the installations at the community level. The organization of the installations into communities, called base support battalions (BSB) was taken as a given for this study effort. The resources provided by the individual installations are summed over the entire BSB, and these aggregate resources are used to constrain the assignment of units. The final decision regarding the disposition of the units in the communities should be made locally.

(4) Together with the elimination from consideration of the installations that are outside of Germany, the above aggregation reduces the number of locations to which units may be assigned to the 22 specified by USAREUR DCSOPS CFE. Even with this order of magnitude reduction in the number of possible locations, the number of unit-location combinations (over 6,000) is still large. Further reduction was thus necessary.

c. Limitations on Unit Assignment Possibilities

(1) The size of the problem can be further reduced and model performance improved by recognizing and capitalizing on structure that had already been imposed on the problem by USAREUR. First, it had been previously decided that the two divisions remaining in Germany, the 1st Armor Division (1AD) and the 3d Infantry Division (3ID), would occupy different subsets of the available locations. It had been decided that the 1AD headquarters would be located in Bad Kreuznach and the 3ID headquarters would be located in Wurzburg; as a result, division sectors were constructed around these two cities. This partitioning limited the number of communities to be considered for each unit, limited the dispersion of divisional units, and prevented interspersing of divisional units. The problem size could then be reduced by eliminating from consideration all unit-location combinations that did not adhere to this plan. Similar limitations were made for other units whose location was limited by some other factor that could be identified. The communities were divided so that each sector contains half of the family housing available. Figure 3-1 shows the communities under consideration and the partitioning of Germany.

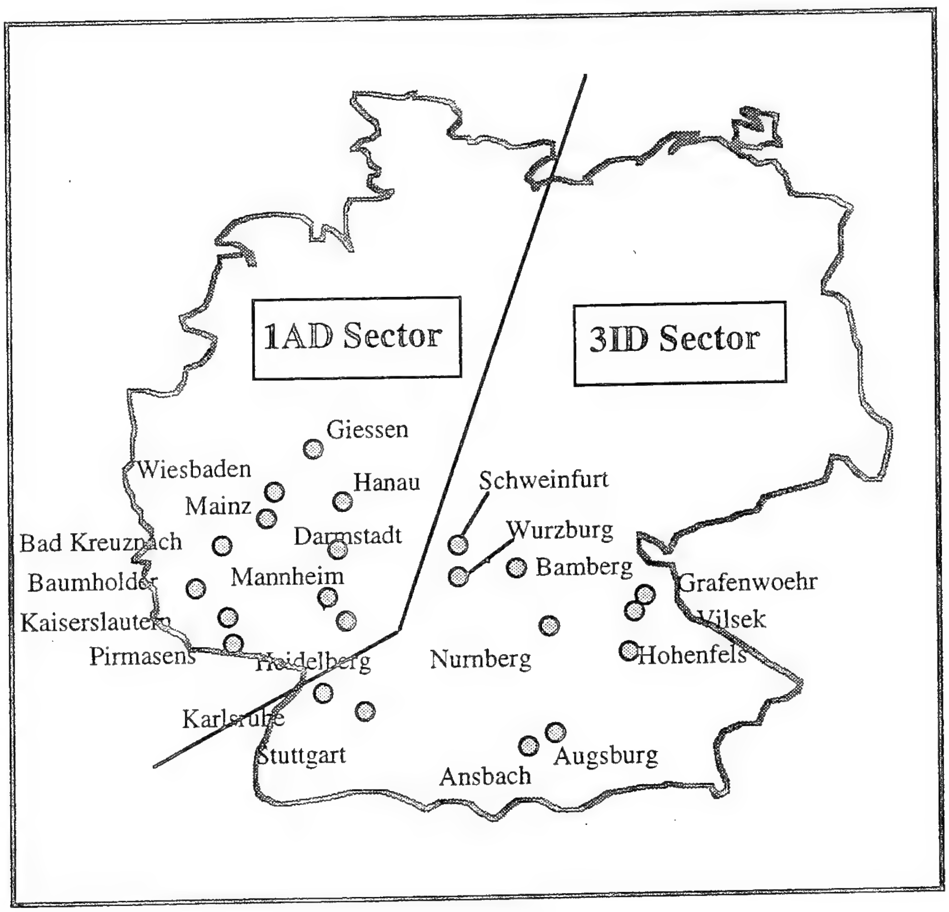


Figure 3-1. Communities and Partitioning

(2) Problem size was reduced further by preprocessing resource availability data. Preprocessing the data allows the identification of locations at which the various units cannot be stationed due to the inadequacy of one or more resources. Any combination that fits into this category can then be eliminated from consideration. In practice, it was noted that between 400 and 500 unit-location combinations were eliminated, significantly reducing the size of the problem. Approximately 1,300 integer variables are used in the model.

Section II. PROBLEM FORMULATION

3-7. PROBLEM FORMULATION - GENERAL

a. In this section, the formulation of the mathematical programming model developed for use in this analysis is described. Note that two slightly different models were studied. The differences involved two different methods of modeling the proximity constraints of units to their subordinates. Both are discussed below.

b. The formulation can be summarized as follows:

$$\text{Min}: \sum_{\text{all units}} \Big(\sum_{\text{all locations}} (\text{unit stationing cost})\Big) + \sum_{\text{all locations}} (\text{location overhead cost})$$

subject to:

Units have sufficient resources at their designated locations.

Resource capacity at the open locations are not exceeded.

Budget for one-time costs is not exceeded.

Units are located within the required proximity of other units in order to facilitate unit mission.

3-8. NOTATION. The following notation is used in formulating the models.

a. The decision variables are binary and are defined as:

$$x_{ij} = \begin{cases} 1, & \text{if unit i is stationed at location j} \\ 0, & \text{otherwise.} \end{cases}$$

$$z_j = \begin{cases} 1, & \text{if location j is open,} \\ 0, & \text{otherwise.} \end{cases}$$

b. Annual costs that are to be minimized in the objective function are defined as:

c_{ij} = cost of stationing unit i at location j,

$\hat{c}_j$ = cost of having location j open.

c. One-time costs and the budget associated with the implementation of a stationing plan are defined as:

$\tilde{c}_{ij}$ = cost of moving unit i to location j,

$\bar{c}_j$ = cost of closing location j.

B = Budget for one-time costs.

d. Resources available at the installations and required by the units are expressed as:

r_{ik} = amount of resource k used by unit i,

R_{jk} = amount of resource k at location j.

e. I = number of units to be stationed, J = number of locations available, and K = number of resource types needed by the units and available at the installations.

f. Since limits are placed on the unit assignments, there is no need to include the variable x_{ij} for every unit i and every location j. Thus, for each unit i the set S_i = set of locations to which unit i may be assigned is defined. Only the variables x_{ij} for which $j \in S_i$ are included.

3-9. OBJECTIVE FUNCTION. The objective of the optimization is to develop a stationing plan that keeps the annual expenditures to a minimum (thus freeing up funds for training, operations, and maintenance) and is written as:

$$\text{Minimize}: \sum_{i=1}^{I} \sum_{j \in S_i} c_{ij} x_{ij} + \sum_{j=1}^{J} \hat{c}_j z_j.$$

3-10. BASIC CONSTRAINTS

a. Investment funds for the purpose of plan implementation are limited and constrained. Note that shutdown costs for any BSB that is recommended for closure are assessed using the complement of the binary variable that indicates whether or not the BSB is open.

$$\sum_{i=1}^{I} \sum_{j \in S_i} \tilde{c}_{ij} x_{ij} + \sum_{j=1}^{J} \bar{c}_j \left(1 - z_j\right) \leq B.$$

b. To ensure that all units are assigned to one and only one allowable location, the standard assignment constraints are introduced:

$$\sum_{j \in S_i} x_{ij} = 1,\ i = 1,\ldots,I.$$

c. To set the value of the z_j variables to unity whenever a unit is assigned to location j, the following constraint type is used. In practice, thousands of these constraints are introduced, slowing the solution of the linear programming relaxation problems that must be solved in the branch and bound algorithm. Later, aggregation of these constraints to reduce run time of the optimization is discussed.

$$z_j \geq x_{ij};\ i = 1,\ldots,I;\ j = 1,\ldots,J. \tag{1}$$

d. To ensure that units are assigned to locations in such a way that their resource requirements are met and that the resource capacities of the locations are not exceeded, the following constraints are introduced:

$$\sum_{i=1}^{I} r_{ik} x_{ij} \leq R_{jk};\ j = 1,\ldots,J,\ k = 1,\ldots,K.$$

3-11. SHARED RESOURCE CONSTRAINTS

a. In addition to the resources available at each installation, there are also resources which are shared by several installations. For example, there are only three hospitals used by the forces in Germany. Installations are partitioned into three sets, one for each hospital, and every unit stationed at some installation in the set is served by the corresponding hospital for that set. Aircraft operations space also falls into this category of resource.

b. To model this kind of resource usage, the following definitions are used. Let L = number of shared resources, and let $\hat{r}_{il}$ = amount of shared resource l consumed by unit i, and $\hat{R}_l$ = capacity of shared resource l available. For each shared resource l, let G_l denote the set of installations served by l. For each resource l the following constraint exists:

$$\sum_{i=1}^{I} \sum_{j \in G_l} \hat{r}_{il} x_{ij} \leq \hat{R}_l,\ l = 1,\cdots,\ L.$$

c. Although shared resources are utilized by several installations, they may actually be attached to a particular one. If this is the case, it must be ensured that the attached location is open whenever some of the shared resource is used. This is achieved as follows. Let j(l) denote the installation to which shared resource l is attached. Then if any of shared resource l is used, installation j(l) must be open. This is modeled by the constraints:

$$z_{j(l)} \geq \frac{1}{|N_l|} \sum_{i \in N_l} \sum_{j \in G_l} x_{ij}, \; l = 1, \cdots, L.$$

where

$$N_l = \{i \mid \hat{r}_{il} > 0\}.$$

3-12. UNIT PROXIMITY CONSTRAINTS

a. As mentioned above, units must be stationed within some prescribed distance from other related units. For example, all the infantry battalions in a brigade should be stationed at a location that is relatively close to their brigade headquarters, with the purpose of maintaining good command and control. To implement this requirement in the optimization model, two different formulations were tried. Both are described below.

b. The first formulation utilized a structure similar to the well studied quadratic assignment problem.[33] To show how this method was implemented, the following additional notation is introduced. Let d_{jj^*} be the given distance between locations j and j^*, and let D_{i^*} be the maximum distance allowed between parent unit i^* and its subordinates. In order to constrain the distances between a unit and its headquarters, or parent unit, it is important to keep track of the assignment of both of the units. This can be accomplished by introducing products of variables in the following constraints. For all parent units i^* and all subordinate units i of parent unit i^*.

$$\sum_{j \in S_i} \sum_{j^* \in S_{i^*}} d_{jj^*} x_{ij} x_{i^*j^*} \leq D_{i^*},$$

c. To eliminate the quadratic terms, the product is replaced by a single variable:

$$\xi_{ii^*jj^*} = x_{ij} x_{i^*j^*}.$$

d. For all parent units i^*, and all subordinate units i of parent unit i^*, model the distance limitations using the linear constraints:

$$\sum_{j \in S_i} \sum_{j^* \in S_{i^*}} d_{jj^*} \xi_{ii^*jj^*} \leq D_{i^*},$$

e. For each parent unit i^*, and subordinate unit i, with locations $j^* \in S_{i^*}$ and $j \in S_i^*$ the following constraint is implemented:

$$\xi_{ii^*jj^*} - x_{ij} - x_{i^*j^*} \geq -1$$

Note that this set of constraints precludes the need for the $\xi_{ii^*jj^*}$ variables to be binary, since this is assured. However, this representation involves the introduction of many new continuous variables and many new constraints. Thus their inclusion is likely to increase the difficulty of solving the problem.

3-13. ALTERNATE UNIT PROXIMITY CONSTRAINTS

a. It has been noted in the literature[34] that the above formulation is not the most efficient one for this type of problem. An alternate formulation based on a set covering scheme has been shown to be more amenable to solution using a branch-and-bound code. This method requires preprocessing prior to solution to define the appropriate constraints.

b. Let P_{i^*} be the set of subordinate units of unit i^*, and let $H_{i^*j^*}$ be the set of locations to which subordinates of unit i^* can be stationed, if unit i^* itself is stationed at location j^*. Thus, if $x_{i^*j^*} = 1$, then for $i \in P_{i^*}$, $x_{ij} = 1$ only if $j \in H_{i^*j^*}$, or

$$\sum_{j \in H_{i^*j^*}} x_{ij} \geq x_{i^*j^*}, \; \forall i \in P_{i^*}, \; \forall i^*, j^*. \qquad (2)$$

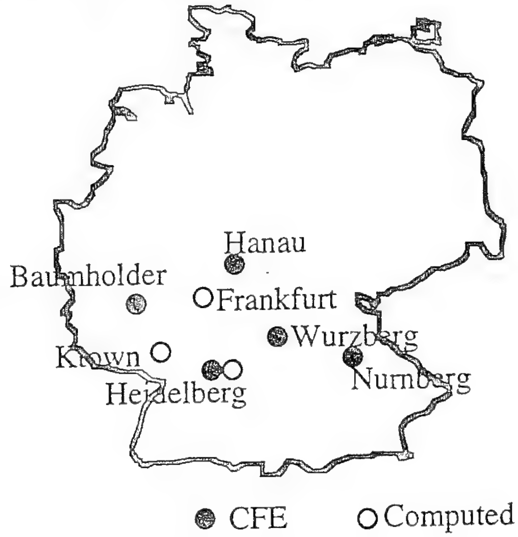
c. As mentioned above, this method requires much more preprocessing than the previous formulation, but this method has the potential to perform better computationally.

Section III. MODELING SUPPORT UNITS

3-14. MODELING SUPPORT UNITS BASED ON DISTANCE RELATIONSHIPS

a. An implicit assumption of the above formulation is that the location of any unit is determined by its proximity to other units. This assumption is incorrect, and this mistake is evidenced by the results from initial model runs. Support units are not defined by their association with a higher headquarters. Personnel administration units, finance units, maintenance units, supply units, transportation units, and others provide support to all customers in a certain geographic region. As such, these units must be stationed so that their capabilities and capacities are not exceeded.

b. To illustrate this point, consider the case of the 266th Theater Finance Command (TFC). As its name implies, this unit is responsible for providing finance support to all the soldiers in the European theater of operations. As such, the subordinate units of the command should be distributed throughout the theater so that they can adequately provide support. Figure 3-2 shows a comparison between the computed stationing of the subordinate units of this command (that resulted from the above formulation) and the stationing plan developed manually by USAREUR DCSOPS CFE personnel.



	CFE	Computed
266 HQ	Heidelberg	Heidelberg
106 FI	Wurzberg	Heidelberg
39 FI	Hanau	Ktown
208 FI	Heidelberg	Frankfurt
8 FI	Baumholder	Frankfurt
501 FI	Nurnberg	Frankfurt

Figure 3-2. Comparison of 266 TFC Locations

c. Observe that the finance battalions, denoted FI in the figure, are concentrated in only three locations in this computed solution. This arrangement would result in too much capability in those locations and not enough in others. The CFE stationing plan is appropriate for this unit's mission.

d. The question was asked: how does the USAREUR staff station this type of unit? The answer was: the stationing decisions are done for the divisional units first. Then the various units are asked to identify a stationing plan for themselves, such that the units whose locations are already specified are adequately supported. Conflicts that arise among the separate stationing plans submitted by the individual support units are then resolved by the staff.

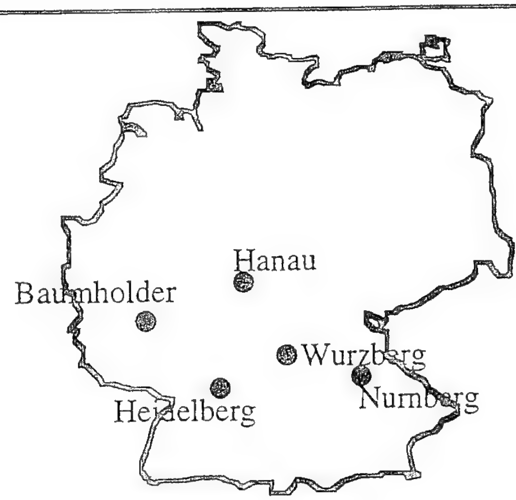
3-15. ALTERNATIVE MODELING APPROACHES FOR SUPPORT UNITS

a. Two modifications to the above formulation were considered to improve the representation of support units in the analysis. The first involved a two-phase approach that resembles the method used in the "by hand" process. In this method, a stationing plan for the "nonsupport" units is developed using the above formulation. When that phase is complete, a second optimization is performed to station the support units. Of course, space at the installations would have to be reserved for the support units in the first phase. Otherwise, sufficient resources might not be available for the support units if their absence in the first phase resulted in too few installations remaining to house them.

b. The second phase optimization would be formulated as a set-partitioning problem with additional constraints.[35] The set of installations would be partitioned into subsets, each of these subsets would be supported by one of the subordinates of the support units currently under consideration. A separate partitioning would be required for each category of support. The additional constraints would be necessary to ensure that sufficient resources are available for these supporting units, and that the capacities of the installations are not exceeded.

c. The above approach would require the development of a new optimization model and would necessarily extend the time needed to complete the analysis and development effort. Consequently, the following method was employed. A partition of the installations was determined in a preprocessing step for each of the categories of support. This partition was based upon the capacities of the installations to contain the relevant commodity that pertains to the category of support under consideration. For example, a finance unit provides support based on the number of military personnel stationed at the various installations that it supports. Thus, an estimate of the requirement for support at an installation can be made based on the capacity at that installation of the critical commodity or commodities.

d. This approach is implemented within the framework of the above formulation by determining the set of allowable locations, J_i, for stationing each support unit, i, such that these sets form a partition of the set of all locations. Determining the set of allowable locations for each unit is not a simple task. Ideally, basis of allocation rules are stated for each type of support unit and incorporated into the model's constraint set. Basis of allocation rules could not be obtained; instead, rules were inferred by reasoning over the CFE solution. The goal of our intellection was to reason from the particular to the general for a given type of unit. This process is best explained by returning to the 266 TFC example. Figure 3-3 represents how CFE stationed the 266 TFC headquarters and its five battalions.



CFE

266 HQ	Heidelberg
106 FI	Wurzberg
39 FI	Hanau
208 FI	Heidelberg
8 FI	Baumholder
501 FI	Nurnberg

Figure 3-3. CFE Locations for 266 TFC

From this stationing plan it is inferred that some finance battalion should be in or near Wurzburg, Hanau, Heidelberg, Baumholder, and Nurnberg. This inference is built into the model by limiting a finance battalion's possible locations to those in the immediate vicinity of the CFE designated location, giving the model room to improve upon the stationing plan while ensuring that implied support relationships are maintained. This is the process that was used and is illustrated in Figure 3-4. The way in which communities were combined into "goose eggs" is contained in Table 5-1, Chapter 5.

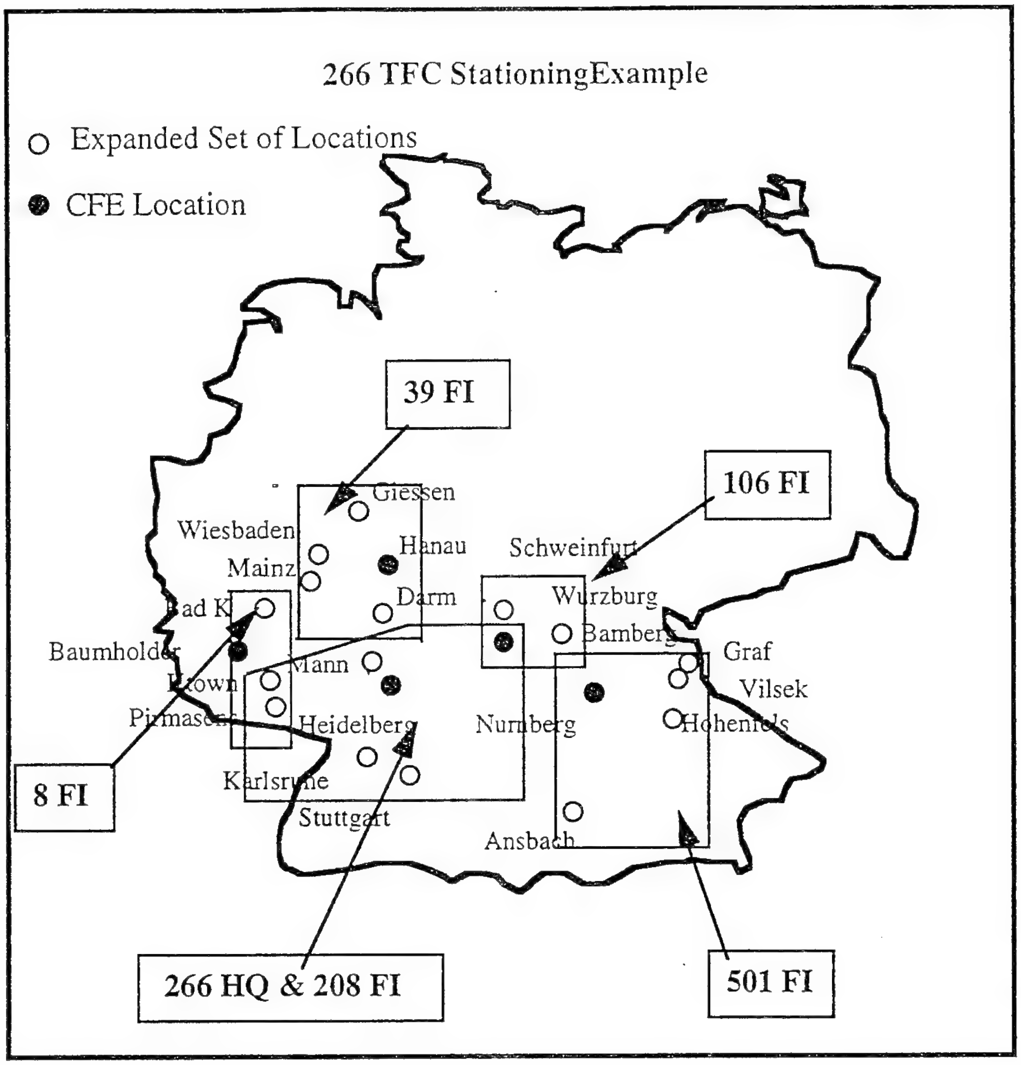


Figure 3-4. Rule Inference for 266 TFC

e. Determining the set of allowable locations for each nondivisional unit presents the exact same problem as support units. Since the problem was the same, the same technique described in paragraph 3-15d was used.

f. Observe that neither of these approaches guarantees global optimality with respect to the total annual cost objective. Also, the second approach requires not only a considerable preprocessing effort, but a postprocessing effort as well. The solution must be examined to ensure that the set of installations recommended to be active are distributed such that no subset has too large or too small a requirement for support. If so, a new partition must be developed and the model must be rerun. In the worst case, several iterations might be required to obtain a stationing policy in which the support requirements are met. Fortunately, in practice, this problem did not arise, and no additional iterations were needed.

CHAPTER 4

IMPLEMENTATION

4-1. GENERAL. This chapter addresses the different formulations of the problem, the computing resources used, and the techniques employed to enable computers to solve this difficult problem.

4-2. QUADRATIC ASSIGNMENT FORMULATION. The quadratic assignment formulation (described in paragraph 3-12) was implemented using the Optimization Subroutine Library[36] (OSL) on IBM RS 6000 Model 500 series workstations. Initially, experiments were conducted with the quadratic assignment formulation of the unit proximity constraints. Although results were obtained, it was found that the run time required to produce feasible integer solutions was excessive. Runs often took several days, and it was determined that this formulation was not the best possible for this problem.

4-3. SET COVERING FORMULATION. The set covering formulation (described in paragraph 3-13) was implemented using the Mixed Integer Optimizer[37] (MINTO). This software provides a front end for a modern simplex code such as OSL or CPLEX[38] and facilitates the easy modification of the formulation, allowing alterations to the branching rules, addition of new constraints, and the like.

4-4. CONSTRAINT AGGREGATION

a. Two of the constraint classes defined in chapter 3 are candidates for aggregation, since they may yield a large number of constraints. There are as many constraints that set location j open whenever a unit is assigned to location j (see constraint type (1) para. 3-10c.) as there are x_{ij} variables, which is a very large number. Also, if the number of parent units, or the number of subordinate units of each parent is large, then the unit proximity constraints (see constraint type (2) para. 3-13b.) will be numerous. An equivalent formulation which reduces the number of constraints is achieved by replacing constraint type (1) with (A) and constraint type (2) with (B).

$$\sum_{i=1}^{I} x_{ij} \le I z_j, \quad j = 1, \ldots, J; \tag{A}$$

$$\sum_{u \in P_i} \sum_{l \in H_{ij}} x_{ul} \ge |P_i| x_{ij}, \quad \forall i, j. \tag{B}$$

b. The disaggregated constraints (1) and (2) can be viewed as valid inequalities for the smaller formulation: each time an LP relaxation of the model is solved, the solution can be checked for violations of these valid inequalities; if violated inequalities are found, they are added to the model, and the LP resolved.

c. Although both forms of aggregation could be useful in the general methodology for the problem at hand, the number of parent units was found to be small, and each had few subordinate units. So aggregation of (2) was not helpful. However, the aggregation of (1) was found to be crucial to effective solution of the problem.

4-5. BRANCHING

a. The model that was formulated clearly encapsulates three levels of decisionmaking. At the top level, there is the decision of whether or not an installation is to remain open, or is to be closed. Then there is the decision of where a parent unit is to be stationed. At the bottom level, it must be decided where subordinate units are to be located. Decisions made at the top two levels restrict the options available at the levels below. This fact provided the motivation to modify the branching priorities. The default in MINTO is to select the variable with the value closest to 0.5 to branch on. Instead, variables reflecting the decision to open or close an installation, the z_j variables, are set to integer before the other variables were branched on. The second priority was placed on the x_{ij} variables where unit i was a parent unit. These priorities reflect the relative levels of impact of the different decisions on later decisions.

b. In addition to the three-level prioritization of variables for branching, a different branching rule was considered other than the usual binary dichotomy. Within each of the lower two priority classes (those for unit assignment variables) a special ordered set branching rule is used which prioritizes the assignment of each unit. For each unit i use the assignment constraint:

$$\sum_{j \in S_i} x_{ij} = 1.$$

Let $\hat{x}$ denote the current LP solution. If $\hat{x}_{ij}$ if fractional for some j, then a set

$$S_i(\hat{x}) \subset S_i,\ S_i(\hat{x}) \neq \emptyset,$$

is identified with the property that

$$\sum_{j \in S_i(\hat{x})} \hat{x}_{ij}$$

is fractional, and branch on the dichotomy: either

$$\sum_{j \in S_i(\hat{x})} \hat{x}_{ij} = 1$$

or

$$\sum_{j \in S_i \setminus S_i(\hat{x})} \hat{x}_{ij} = 1.$$

c. Careful consideration was given to how this set should be chosen for each i, and also to which i out of a priority class should be selected to branch on. Initially, consideration was given to ordering the variables in each set S_i by cost, say

$$S_i = \{j_1, j_2, \ldots, j_{ni}\}$$

where

$$c_{ij1} \leq c_{ij2} \leq \cdots \leq c_{ijn_i},$$

and then selecting

$S_i(\hat{x}) = \{j_1, j_2, \ldots, j_{k_i}\}$, where k_i is chosen so as to make the value of $\sum_{k=1}^{k_i} x_{ij_k}$ as close as possible

to 0.5. Then the branch was made on the set constraint for which this quantity was closest to 0.5. However, it was found that better success could be achieved with the following rule in which the point of division of the set S_i is determined by weighting the unit assignment costs with the value of the corresponding variable in the current solution. For each unit i set:

$$S_i(\hat{x}) = \left\{ j' \;\middle|\; c_{ij'} \leq \sum_{j \in S_i} c_{ij}\hat{x}_{ij} \right\}$$

and branch on the set constraint for the unit which solves the following:

$$\max_{i=1,\ldots,I} \left(\min_{j \in S_i \setminus S_i(\hat{x})} c_{ij} - \max_{j \in S_i(\hat{x})} c_{ij} \right).$$

4-6. VARIABLE FIXING

a. Despite efforts to develop a good formulation and effective branching rules, a great deal of difficulty was encountered in determining a good integer solution for the larger problem. Without a good integer solution, the number of active nodes in the branch-and-bound tree grows rapidly. The result is that all available memory is consumed before a near-optimal solution is found. The key to obtaining a good integer solution proved to be variable fixing: given some tolerance $\varepsilon > 0$, and an LP-optimal solution $\hat{x}$, for any unit i and any installation $j \in S_i$ with

$$\hat{x}_{ij} > 1 - \varepsilon,$$

the equality $x_{ij} = 1$ is added. This effectively fixes variables whose values are close to 1 for the remainder of the procedure. After experimentation, the value $\varepsilon = 0.01$ was used, and after searching 9 nodes of the branch-and-bound tree, found an integer solution having cost within 3.0 percent of the cost of the LP solution at the root node, i.e., within 3.0 percent of optimal.

b. Once a good integer solution was obtained using variable fixing, the optimization procedure was run again, this time without fixing variables. However the bound obtained from variable fixing was used to reduce the number of nodes that needed to be explored. After searching fewer than 1,000 nodes, this strategy yielded a better integer solution, having a gap of 2.7 percent from the LP relaxed solution.

CHAPTER 5

RESULTS

5-1. GENERAL. The purpose of this chapter is to demonstrate that the FUSSPRINT methodology can produce reasonable, feasible, and near optimal stationing plans. This is done by citing illustrative examples of two results developed during the study. A secondary purpose of this chapter is to discuss and explain the information in the results appendix, Appendix E. Examining more than one result highlights the following two points: (1) The FUSSPRINT optimization model will always produce a near optimal solution. (2) The solutions differ in detail but not in substance, so the insights gained from all model iterations are consistent. Comparisons are made with the CFE solution to the extent that is possible. It is important to emphasize that the CFE result is not being viewed in context. CFE stationed 100 percent of the force in Germany using 34 communities. Comparisons are based upon the common 80 percent of the units that were modeled in this study. Nevertheless, comparison is the best way to demonstrate FUSSPRINT's effectiveness and usefulness.

5-2. KEY OBSERVATIONS. Analysis indicates that there are many ways to assign the 235 units to a minimal set of communities in a near, within 3 percent, optimal fashion. As stated previously, the goals of this study were to develop a responsive stationing methodology for USAREUR and to provide insights into stationing issues. The goal was not to specify unit to location assignments. The main insights proffered here are that (1) this problem can be formulated and solved as an optimization and that (2) 80 percent of the 65K force can be stationed in roughly 20 communities.

5-3. INITIAL MODEL CONDITIONS AND PREVIOUSLY MADE DECISIONS

a. Two hundred thirty-five units were considered. Twenty-seven units (14 aviation, 6 headquarters elements, and 7 miscellaneous) were fixed at their CFE designated community. The process of fixing these units to specified locations dictated that 10 of the 21 communities considered in this experiment remained open and reduced the potential savings in annual costs. Nevertheless, these apriori command decisions were required to be represented in any recommended stationing plan.

b. Germany was partitioned into two division sectors (see Figure 3-1, Chapter 3). Divisional units were required to be stationed in their sector. Combat units were constrained to be within 100 miles of their higher headquarters.

c. All nondivisional units were constrained to be in the general vicinity of their CFE designated location as described in paragraph 3-15d. Table 5-1 contains the community combinations that were developed to ensure that a support unit was located in the proper region of the country and to limit the number of possible locations to which a unit could be assigned. If CFE assigned a unit to the first column then the unit was allowed to be assigned to any community in that row, as long as the community was capable of supporting that particular unit's resource requirements.

Table 5-1. Community Sets

Ansbach	Nurnburg	Hohenfels	Wurzburg			
Augsburg	Stuttgart	Ansbach				
Bad Kreuznach	Mainz	Baumholder	Wiesbaden			
Bamberg	Schweinfurt	Wurzburg	Nurnburg			
Baumholder	Bad Kreuznach	Kaiserslautern	Pirmasens			
Darmstadt	Hanau	Wiesbaden	Mainz			
Giessen	Wiesbaden	Mainz	Hanau			
Grafenwoehr	Vilsek	Nurnburg	Hohenfels	Ansbach		
Hanau	Giessen	Darmstadt	Wiesbaden	Mainz		
Heidelberg	Mannheim	Karlsruhe	Kaiserslautern	Pirmasens	Stuttgart	Wurzburg
Hohenfels	Nurnburg	Ansbach	Grafenwoehr	Vilsek		
Karlsruhe	Pirmasens	Kaiserslautern	Mannheim	Heidelberg	Stuttgart	
Kaiserslautern	Pirmasens	Baumholder	Bad Kreuznach	Mannheim	Heidelberg	
Mainz	Wiesbaden	Darmstadt	Hanau			
Mannheim	Kaiserslautern	Heidelberg	Darmstadt	Karlsruhe	Pirmasens	
Nurnburg	Ansbach	Hohenfels	Grafenwoehr	Vilsek		
Pirmasens	Kaiserslautern	Karlsruhe	Baumholder	Mannheim	Bad Kreuznach	
Schweinfurt	Wurzburg	Baumholder				
Stuttgart	Karlsruhe	Augsburg	Heidelberg			
Vilsek	Grafenwoehr	Nurnburg	Hohenfels	Ansbach		
Wiesbaden	Mainz	Darmstadt	Hanau			
Wurzburg	Schweinfurt	Baumholder				

5-4. COSTS. Note that these cost comparisons are based upon the 80 percent of the units common to this study and the CFE solution. CFE uses 34 communities (resulting in much higher costs than those reflected here) to station the entire force in Europe. The annual cost for Result 1 is $364 million, $54 million cheaper than the CFE solution. The annual cost for Result 2 is $363 million, $55 million cheaper than the CFE solution. An initial investment to move units and to close facilities will be paid back in less than 2 years. Long-term savings can be generated by implementing a near optimal stationing plan.

5-5. COMMUNITIES. The CINC USAREUR directed that use be made of the best installations and communities available in restationing the force. The best installations and communities available were specified by USAREUR personnel. The start point for analysis was neither the 858 installations available to USAREUR nor the 34 communities used by CFE to station the 65K end-state force, but rather the 22 communities used by CFE to station the 78 percent force structure. Using this small set of communities helped to guide the process of producing a model that could station the force effectively. A natural check was in place to ensure data used as inputs to the model on resource availability and unit's requirements did not violate expert knowledge of the real world. It is now a trivial task to consider any set of communities for stationing the force, as long as legitimate data is available on resource availability and unit's requirements. Figure 5-1 shows the set of 21 communities selected in both solutions.

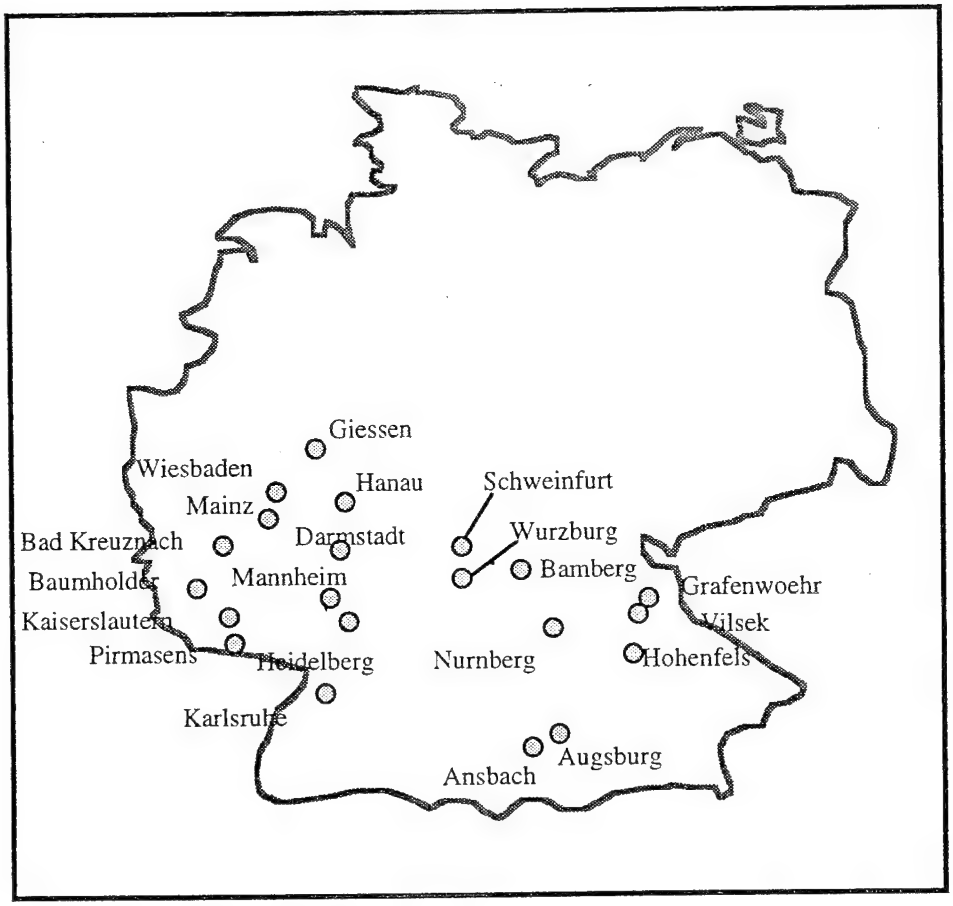


Figure 5-1. Communities Used to Station the Force

5-6. ASSIGNMENTS. Two representative unit to community assignment solutions (Result 1 and Result 2) are contained in Appendix E. Appendix E is indexed by UIC. The CFE choice for stationing a particular unit is in the ES-MILCOM column. Graphic examples from the assignment solutions are presented in Figures 5-2 and 5-3. The purpose of these figures is to graphically portray a portion of the solution to demonstrate that stated objectives for locating units were achieved.

a. Stationing Objectives:

(1) Combat Arms units are within 100 miles of their higher headquarters,

(2) A unit's utilization of certain resources is met,

(3) The availability of certain resources in a community are not exceeded,

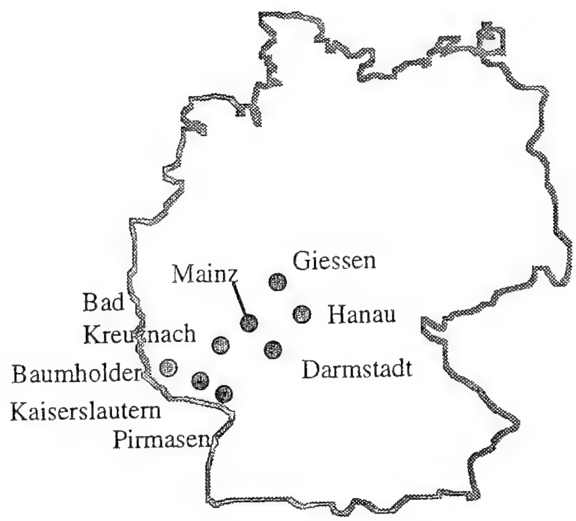
(4) Support units are properly dispersed,

(5) Command decisions on units to locations are met,

(6) Segregation of the 1AD and the 3ID.

b. Figure 5-2 shows two possible stationing plans for selected 1st Armored Division combat units and contrasts them to the CFE solution. Note that battalions are closely located to their brigade headquarters, and that all units are located in the western half of Germany.

1st AD Combat Units

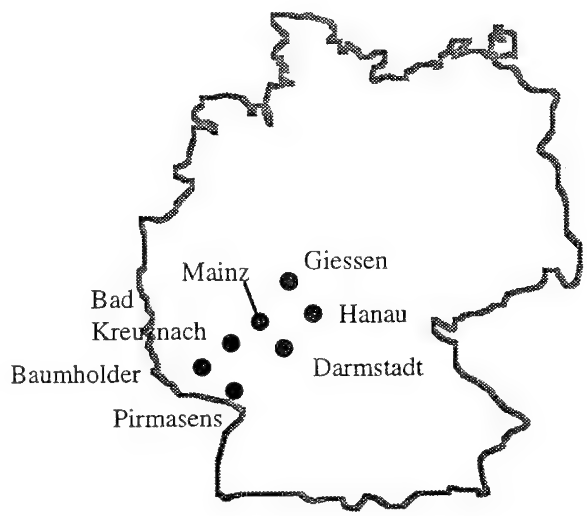


	Result 1	Result 2	CFE
1 AD HQ	Bad Kreuznach	Bad Kreuznach	Bad Kreuznach
1st Bde			
HHC Bde	Giessen	Bad Kreuznach	Giessen
2-67 AR	Mainz	Mainz	Giessen
3-5 IN	Giessen	Baumholder	Giessen
4-67 AR	Giessen	Giessen	Giessen
2nd Bde			
HHC Bde	Mainz	Darmstadt	Baumholder
3-12 IN	Baumholder	Baumholder	Baumholder
4-6 IN	Darmstadt	Baumholder	Baumholder
2-68 AR	Baumholder	Giessen	Baumholder
4th Bde (All)	Hanau	Hanau	Hanau
DIVARTY			
HHB	Giessen	Darmstadt	Baumholder
4-29 FA	Bad Kreuznach	Baumholder	Baumholder
6-29 FA	Baumholder	Pirmasens	Baumholder
2-3 FA	Pirmasens	Kaiserslautern	Giessen
C/333	Baumholder	Mainz	Baumholder

Figure 5-2. Selected 1AD Combat Units

c. Figure 5-3 shows two possible stationing plans for selected 1st Armored Division support units and contrasts them to the CFE solution. Note that the units are well dispersed throughout the western half of Germany.

1st AD Support Units



	Result 1	Result 2	CFE
DISCOM			
HHC	Baumholder	Giessen	Bad Kreuznach
HHD 123	Baumholder	Pirmasens	Bad Kreuznach
A/123	Baumholder	Baumholder	Bad Kreuznach
B/123	Baumholder	Baumholder	Bad Kreuznach
C/123	Giessen	Hanau	Baumholder
D/123	Pirmasens	Baumholder	Baumholder
E/123	Bad Kreuznach	Baumholder	Mainz
F/123	Baumholder	Baumholder	Bad Kreuznach
501 FSB	Baumholder	Giessen	Giessen
47 FSB	Baumholder	Giessen	Baumholder
1AD TROOPS			
5-3 AD	Giessen	Giessen	Mainz
25 CM	Darmstadt	Mainz	Hanau
4-1 AR	Darmstadt	Darmstadt	Hanau
501 MI	Hanau	Hanau	Bad Kreuznach
Band	Giessen	Bad Kreuznach	Bad Kreuznach
501 MP	Mainz	Hanau	Bad Kreuznach
141 SC	Baumholder	Mainz	Bad Kreuznach

Figure 5-3. Selected 1AD Support Units

d. Figure 5-4 shows two possible stationing plans for the 266 TFC and contrasts them to the CFE solution. Note that the five finance battalions (denoted FI) are well positioned to provide support across Germany in both solutions.

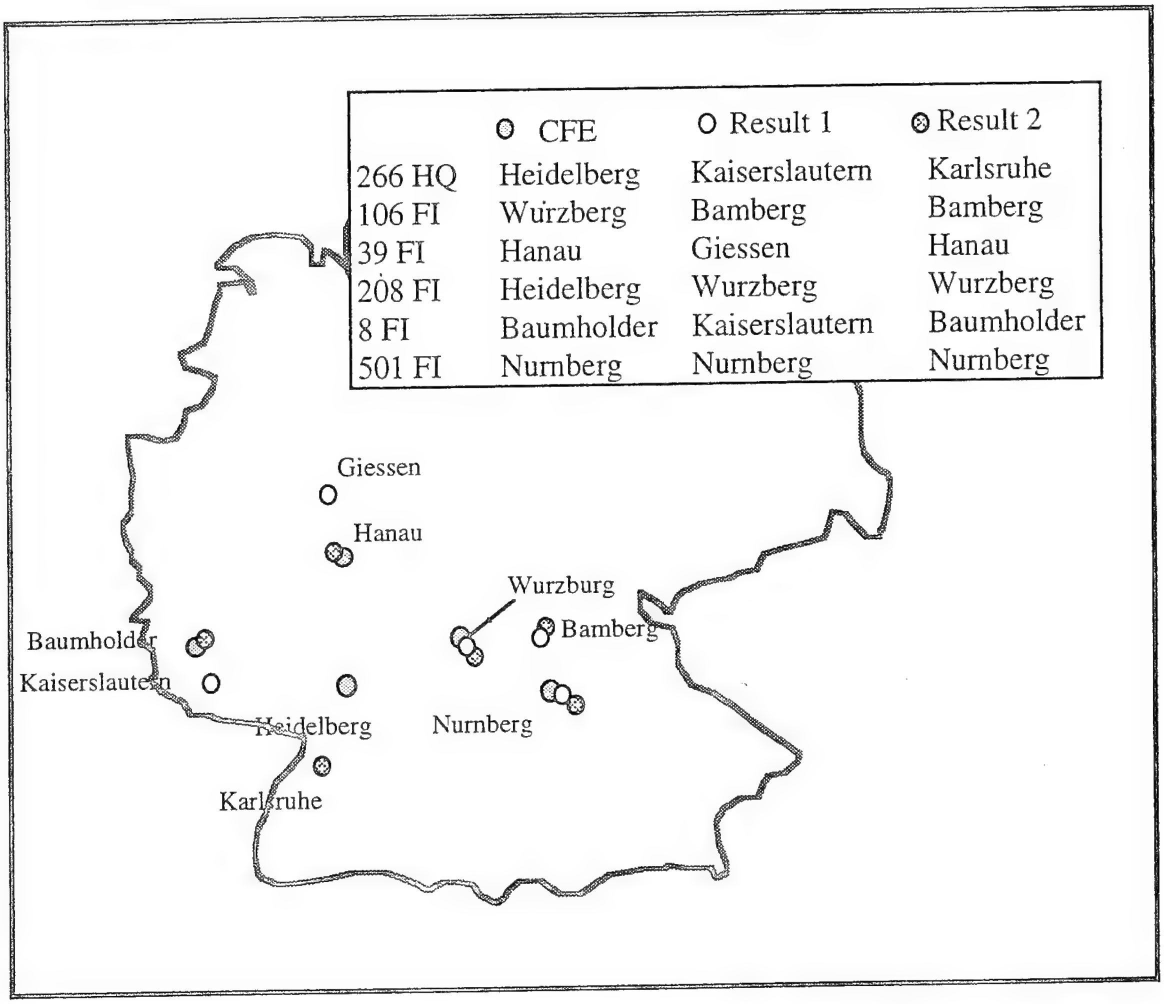


Figure 5-4. 266 Theater Finance Command

5-7. POPULATION DENSITY BY COMMUNITY. Figure 5-5 illustrates the population density for those communities recommended for utilization in each separate result. Note that this is not a one-to-one comparison. Again, the CFE solution accounts for 100 percent of the 65K force using 34 communities while this study addresses 80 percent. The data is presented side by side to emphasize that one-to-one comparisons are possible in an expanded study effort. It is important to note the following 10 communities are forced open by command decision: Ansbach, Bad Kreuznach, Grafenwoehr, Hanau, Heidelberg, Hohenfels, Kaiserslautern, Mannheim, Weisbaden, and Wurzburg. Special circumstances are involved regarding each of these 10 locations; for example, Mannheim houses a needed confinement facility, Grafenwoehr and Hohenfels are important training areas, et cetera.

5-8. RESOURCE UTILIZATION BY COMMUNITY

a. Introduction. Presentation of this data demonstrates the FUSSPRINT methodology's ability to constrain any stationing process by any set of resources deemed relevant. Remember that 10 communities are open by command decision and are forced into the solution.

b. Utilization of Family Housing. As expected, available family housing is utilized efficiently in the communities forced to be open (Figure 5-6). Wiesbaden is primarily an Air Force community from which the Army receives some support. Grafenwoehr and Hohenfels primarily house units that support the training mission of these facilities. Karlsruhe is preferred over Mannheim by FUSSPRINT because of its diverse and ample resources and competitive operating costs.

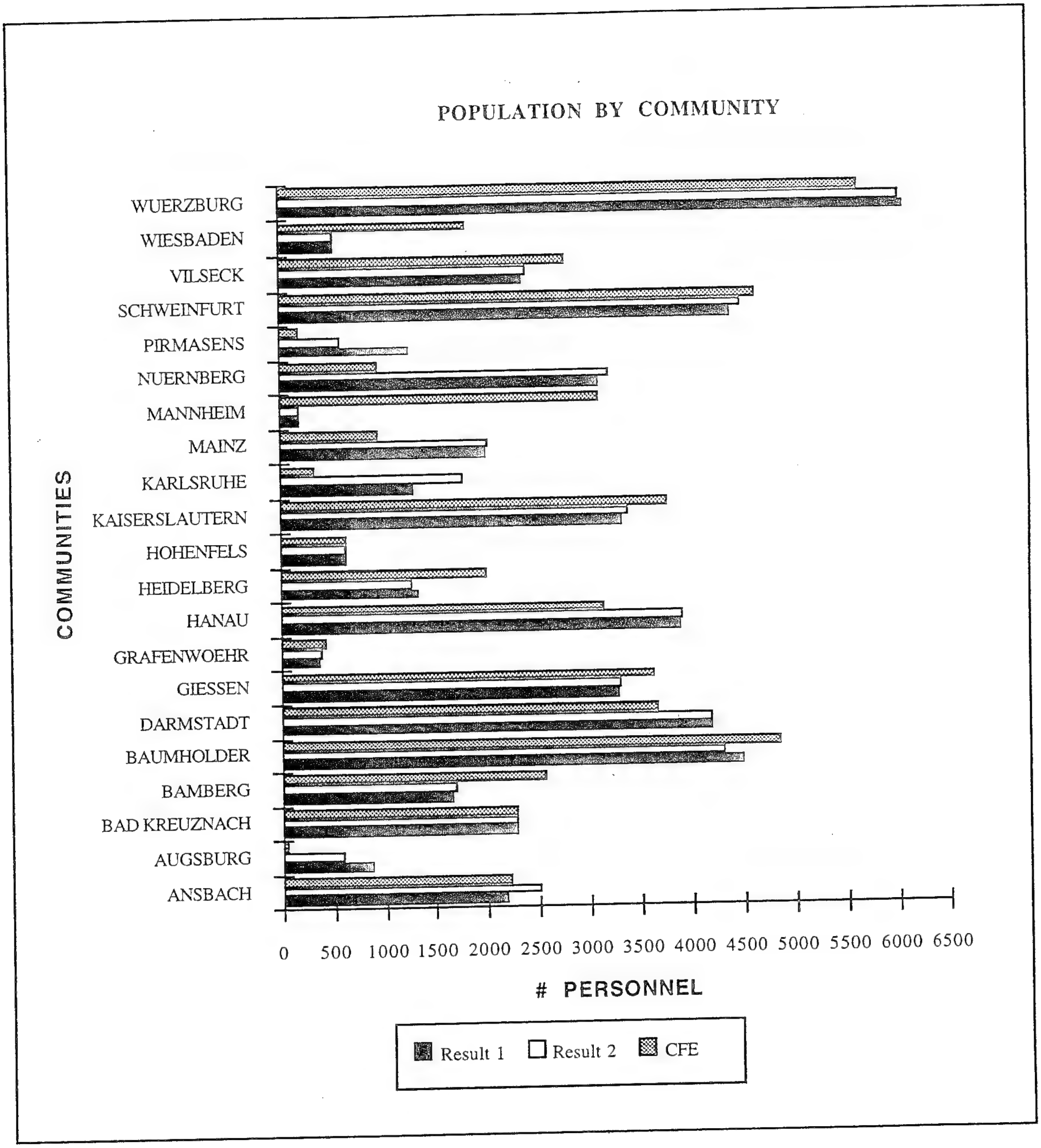


Figure 5-5. Population by Community Comparison

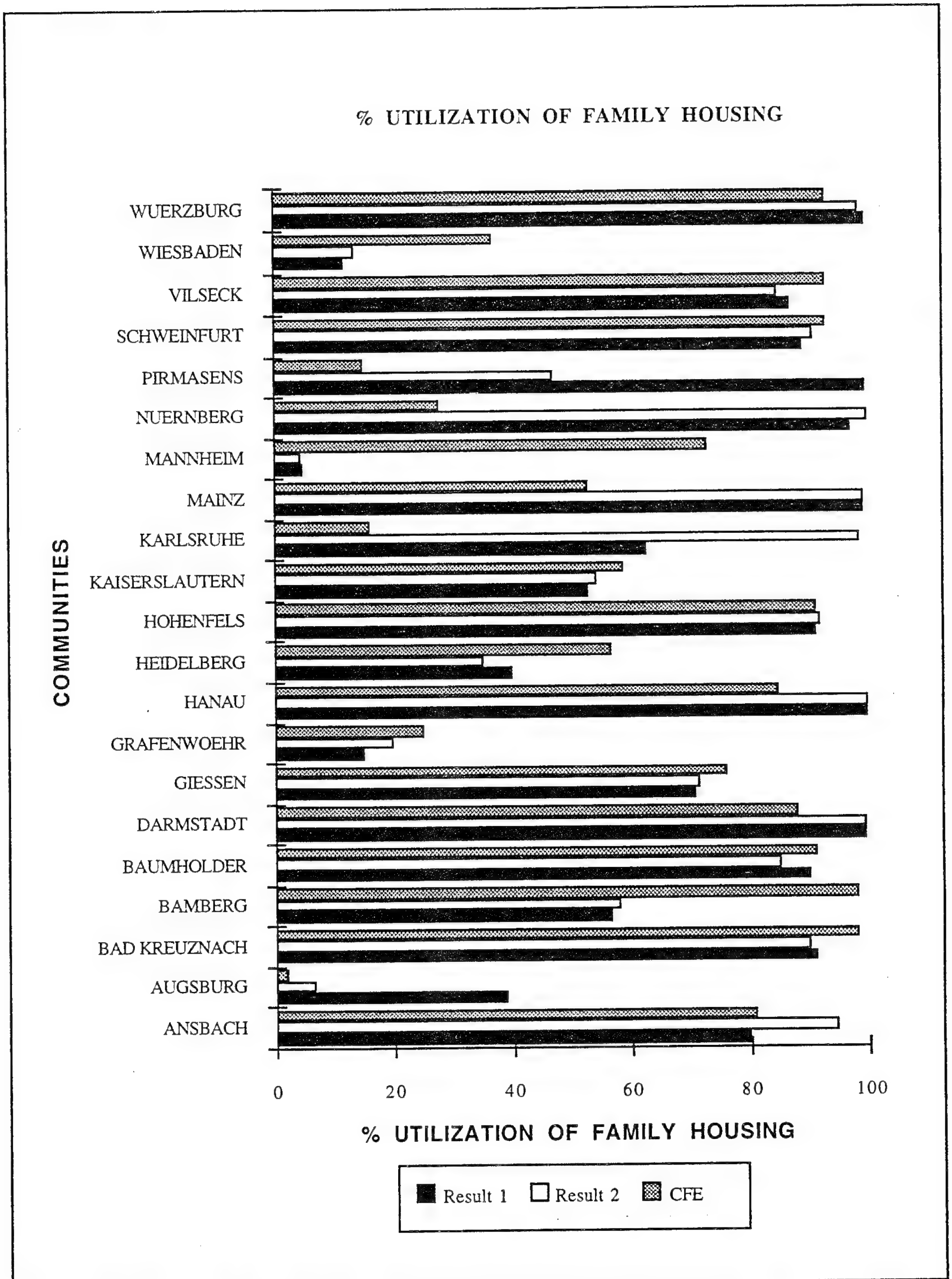


Figure 5-6. Utilization of Family Housing

c. **Utilization of Administrative Office Space.** Here available office space is utilized most efficiently in the communities forced to be open (Figure 5-7). Wiesbaden is primarily an Air Force community from which the Army receives some support. Ansbach is forced to be open, but its distance is relatively far from unit concentrations at the start point of the analysis. Mannheim is forced open but lacks a diverse resource base and has high operating costs.

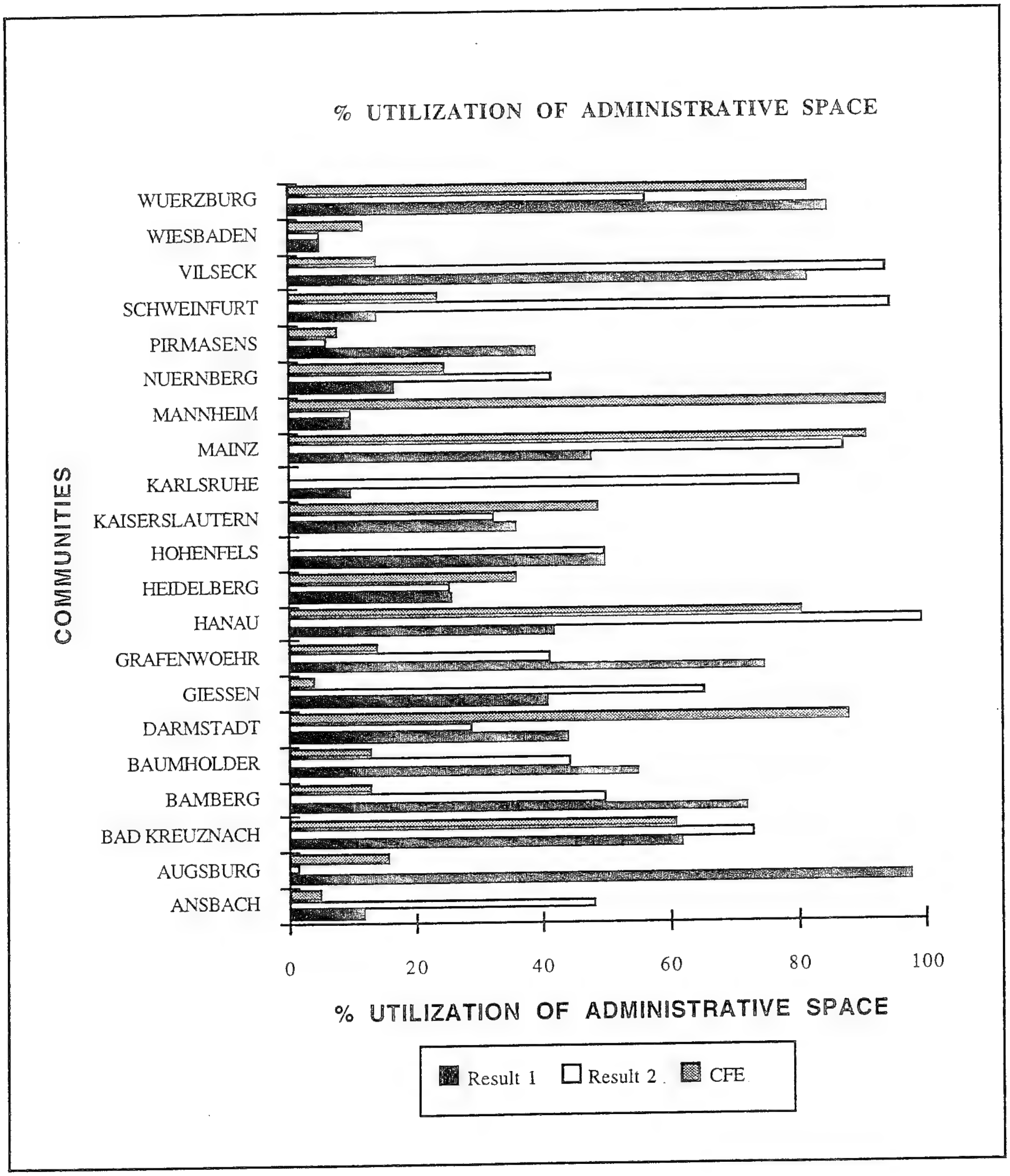


Figure 5-7. Utilization of Administrative Space

d. Utilization of Maintenance Space. Available maintenance space is utilized efficiently in the communities forced to be open and is a more scarce resource than administrative space (Figure 5-8). Mannheim is forced open but lacks a diverse resource base and has high operating costs. Wiesbaden is primarily an Air Force community from which the Army receives some support.

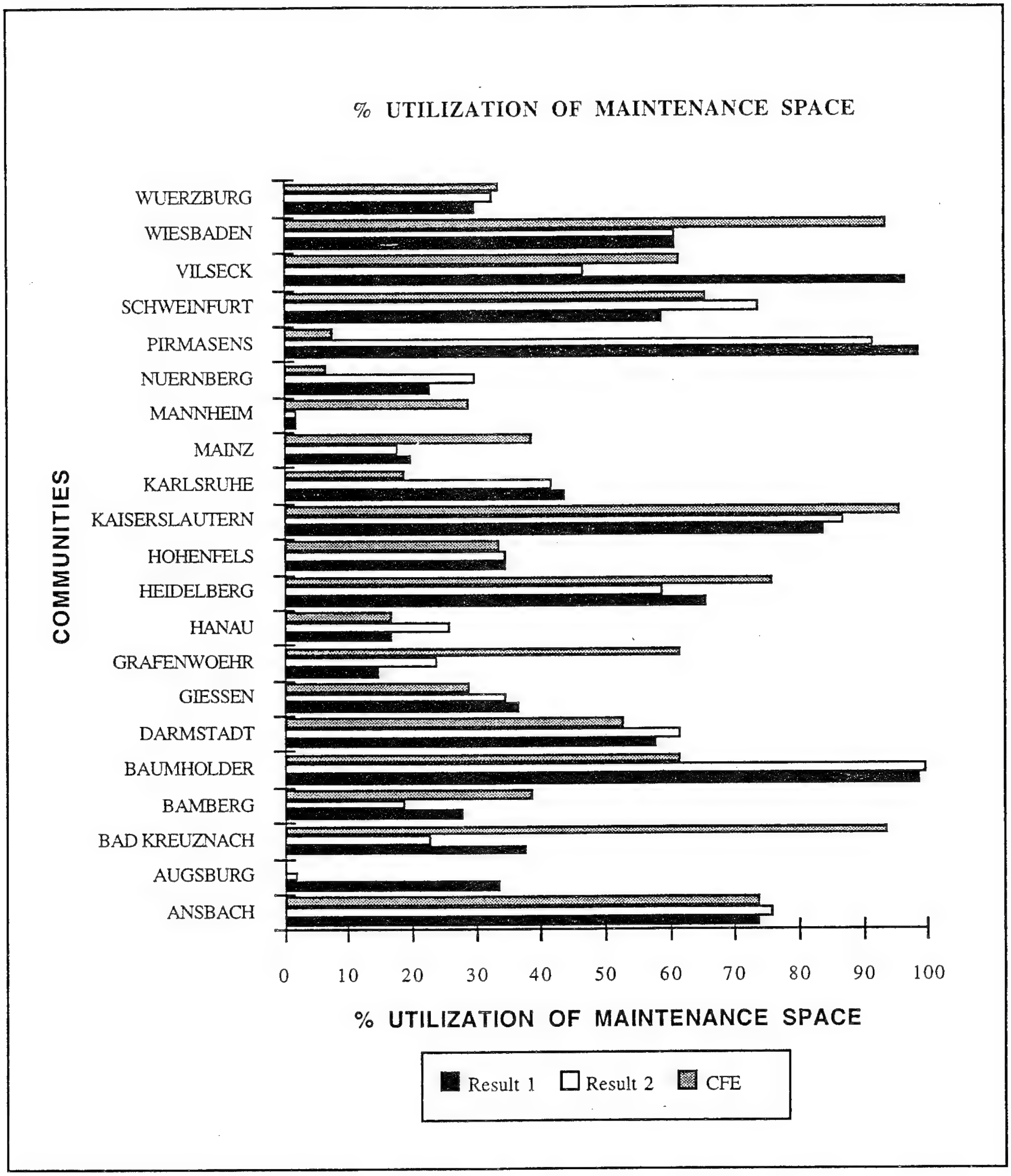


Figure 5-8. Utilization of Maintenance Space

e. **Utilization of Vehicle Hardstand.** Available vehicle hardstand is also utilized efficiently in the communities forced to be open, as shown in Figure 5-9.

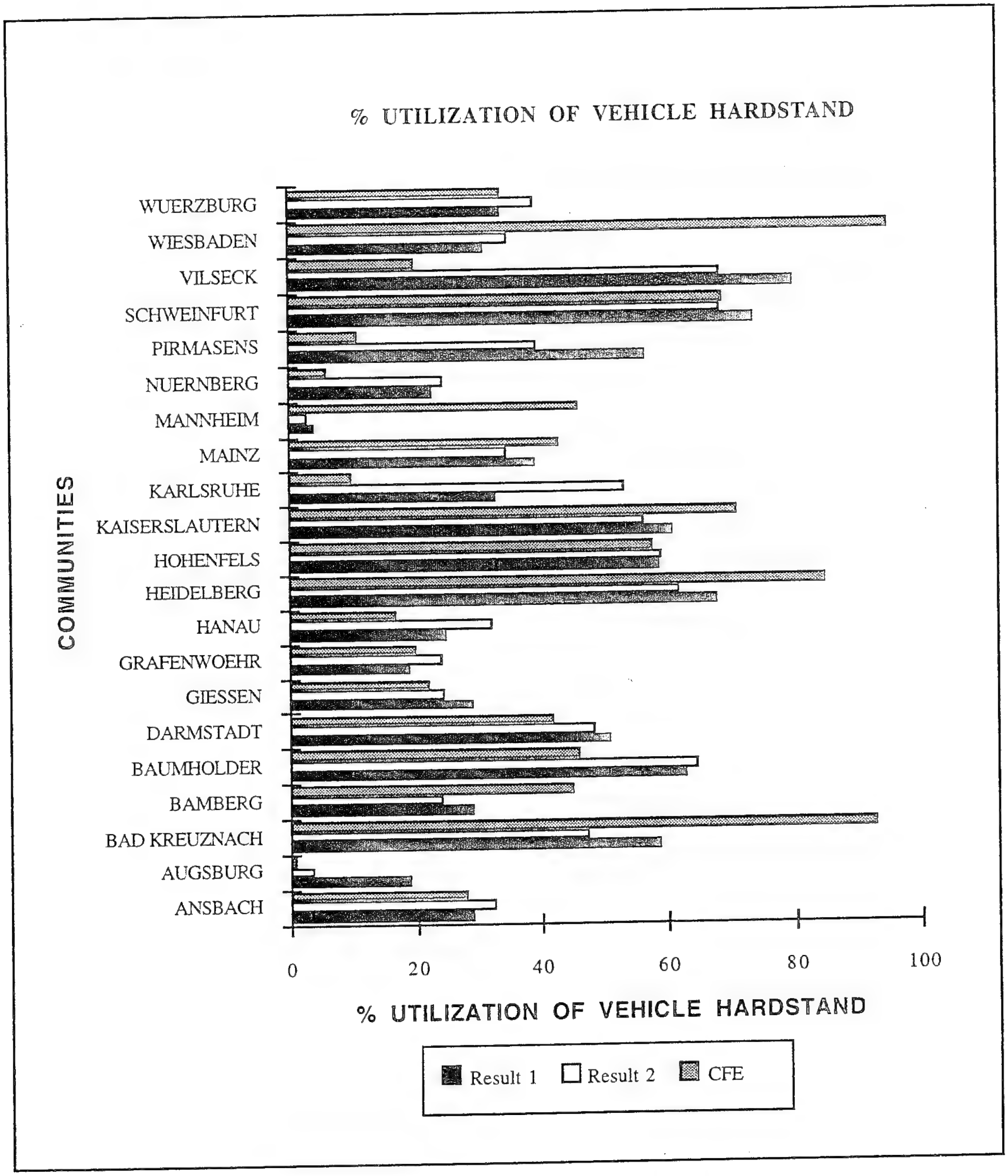


Figure 5-9. Utilization of Vehicle Hardstand

5-9. RESULTS SUMMARY.

a. The results indicate that the study objective has been achieved; the FUSSPRINT model does a good job of producing reasonable, feasible, and near optimal stationing plans. The results also indicate that FUSSPRINT is a valuable decision support tool for restationing issues.

b. This chapter cites illustrative examples of two representative results developed during the study.

c. Comparisons were made with the CFE solution to demonstrate FUSSPRINT's effectiveness and usefulness.

APPENDIX A

STUDY CONTRIBUTORS

1. STUDY TEAM

a. Study Director

LTC Andrew Loerch, Value Added Analysis Division

b. Team Member

MAJ John E. Anzalone

c. CAA Contributors

Ms. Judith Bundy

Mr. Joe Gordon

2. PRODUCT REVIEW BOARD

Mr. Ronald J. Iekel, Chairman
MAJ Stephen Parker
Mr. Robert Solomonic

3. EXTERNAL CONTRIBUTORS

Dr. Natashia Boland, Georgia Institute of Technology
Dr. Ellis Johnson, Georgia Institute of Technology
Mr. Melvin Mitchell, USAREUR, DCSOPS, Conventional Forces Europe
Dr. George Nemhauser, Georgia Institute of Technology

APPENDIX B

STUDY DIRECTIVE

PART 1

REQUEST FOR ANALYTICAL SUPPORT

1. Performing Directorate/Division: RSV | 2. Account Number: 93013

3. Type Effort (Enter one): S — S - Study; Q - QRA; P - Project; R - RAA

Mode (Contract=C):

4. Tasking (Enter one): V — F - Formal Directive; I - Informal; V - Verbal

5. Title: Finding an Optimal Stationing Policy for USAREUR

6. Acronym: FUSSPRINT | 7. Date Request Received: 12/01/92 | 8. Date Due: 12/01/95

9. Requester/Sponsor (i.e., DCSOPS): DCINC USAREUR | 10. Sponsor Division (i.e., SSW, N/A) AEADC

11. Impact on Other Studies, QRA, Projects, RAA:

12. Product Required: Study Report

13. Estimated Resources Required: | a. Estimated PSM: 48.0 | b. Estimated Funds:

c. Models Req'd: FUSSPRINT Optimization | d. Other:

14. Objective(s)/Abstract:
Objective: To develop a decision support tool for USAREUR restationing issues.
Abstract: With the continuing reduction of forces in Europe, it is apparent that the base support structure cannot be maintained at the current levels. The purpose of this study is to develop a methodology to assign units remaining in Europe to Base Support Battalions (BSB) in an economical manner, and to make recommendations regarding which BSBs are candidates for deactivation and closure.

15. Study Director/POC: Last Name: Loerch | First: Andrew | Date:
Signature: [signature] | Phone#: 295-1105

GO TO BLOCK 20 *If this is A STUDY.* See Tab C of the Study Directors' Guide for preparation of a Formal Study Directive.

PART 2

16. Background/Statement of Problem*: USAREUR force structure reduced from 213K to 65K. Recommend a stationing plan for units.

17. Scope of Work*: Use 80% of the 65K force structure. Analyze communities specified by USAREUR DCSOPS CFE.

18. Issues for Analysis*: Develop a model that can station USAREUR units effectively.

19. Milestones/Plan of Action*: Data collection and research: Dec 93. Execution/analysis: Dec 94. Documentation: May 95.

20. Division Chief Concurrence: | Date:

21. Sponsor (COL/DA Div Chief) Concurrence: | Date:

22. Sponsor Comments*:

CAA Form 233   * Continue on separate sheet   Previous editions Obsolete

APPENDIX C

REFERENCES

DEPARTMENT OF THE ARMY

US Army Europe (USAREUR) and 7th Army Publications

1. USAREUR Circular 37-11, Fiscal Year 1992 Factors Handbook

2. USAREUR Pamphlet Continuity, Change, Growth

3. 2. USAREUR Quality of Life Standards

US Army Concepts Analysis Agency (CAA)

4. Meeting between LTC Loerch of FUSSPRINT Study Team, CAA, and LTG Schroeder, Deputy Commander in Chief USAREUR, subject: FUSSPRINT study guidance, Dec 91.

5. Meetings between MAJ Anzalone of FUSSPRINT Study Team, CAA, and Mr. Melvin Mitchell, USAREUR DCSOPS CFE, subjects: CINC USAREUR's Reduction Philosophy, unit stationing criteria, and other study related issues, Nov 93 and June 94.

6. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and CPT Grzybowski, USAREUR DCSRM, subjects: costs associated with operating an area support group (ASG) and base support battalion (BSB), Nov 93.

7. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and MAJ Brumback, operations officer, 266 Theater Finance Command (TFC), subject: 266 TFC unit stationing considerations, Nov 93.

8. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and Mr. Ramsaur, V Corps, subject: V Corps unit stationing considerations, Nov 93 and June 94.

9. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and MAJ Sanford, operations officer 7th Medical Command , subject: 7th Medical Command unit stationing considerations, Nov 93.

10. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and MAJ Fenn, USAREUR DCSENG, subjects: USAREUR DCSENG data bases, real property assets, and unit authorizations and requirements, Nov 93.

11. Meetings between MAJ Anzalone of FUSSPRINT Study Team, CAA, and Mr. Loeffler, USAREUR DCSENG, subjects: USAREUR DCSENG data bases, real property assets, and unit authorizations and requirements, Nov 93 and June 94.

12. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and Mr. Hurd, USAREUR DCSRM, subjects: costs associated with operating an area support group (ASG) and base support group (BSB), Jun 94.

13. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and Mr. Slaughter, USAREUR DCSENG, subjects: USAREUR DCSENG data bases, real property assets, and unit authorizations and requirements, June 94.

14. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and Mr. LeFevre, USAREUR DCSENG, subjects: USAREUR DCSENG data bases, real property assets, and unit authorizations and requirements, June 94.

15. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and LTC Mattson, USAREUR DCSENG, subjects: USAREUR DCSENG data bases, real property assets, and unit authorizations and requirements, June 94.

16. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and Ms. Maureen Wylie, Office of theAssistant Secretary of the Army for Installation Management (ASAIM), subjects: Base Realignment and Closure Commission (BRAC) methodology and results and the Real Property Plans and Analysis (RPLAN) model, Jan 94.

17. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and Mr. Stuart Drury, Office of theDeputy Chief of Staff of the Army for Operations and Plans (DAMO-FD-Z),subject: USAREUR unit stationing considerations, Jan 94.

18. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and COL Hileman, Office of theDeputy Chief of Staff of the Army for Operations and Plans (DAMO-FD-O), subject: USAREUR unit stationing considerations, Jan 94.

19. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and MAJ Pearsall, Office of theDeputy Chief of Staff of the Army for Operations and Plans (DAMO-FD-Z),subject: USAREUR unit stationing considerations, Jan 94.

20. Meeting between MAJ Anzalone of FUSSPRINT Study Team, CAA, and LTC Julia, CAA ,subjects: the Force Analysis Simulation of Theater Administrative and Logistic Support (FASTALS) model and USAREUR force structure considerations, Jan 94.

21. FONECON between MAJ Anzalone of FUSSPRINT Study Team, CAA, and LTC Richberg, United States Military Academy, subjects: USAREUR DCSENG data bases, real property assets, and unit authorizations and requirements, Jan. 94.

22. FONECON between MAJ Anzalone of FUSSPRINT Study Team, CAA, and MAJ Kacsur, operations officer 266 TFC , subject: 266 TFC unit stationing considerations, Mar 94.

23. FONECON between MAJ Anzalone of FUSSPRINT Study Team, CAA, and LTC Cadow, 130 Eng Bde, subject: 130 Eng Bde unit stationing considerations, Mar 94.

24. FONECON between MAJ Anzalone of FUSSPRINT Study Team, CAA, and LTC Gene Nosco, 3d Corps Support Command (COSCOM), subject: 3 COSCOM unit stationing considerations, Mar 94.

25. FONECON between MAJ Anzalone of FUSSPRINT Study Team, CAA, and MAJ Medina, 3 COSCOM, subject: 3 COSCOM unit stationing considerations, Mar 94.

26. FONECON between MAJ Anzalone of FUSSPRINT Study Team, CAA, and MAJ Caprano, 37th Transportation Battalion, subject: 37th unit stationing considerations, Mar 94.

27. FONECON between MAJ Anzalone of FUSSPRINT Study Team, CAA, and MAJ Colbert, USAREUR Provost Marshall, subject: stationing considerations for USAREUR military police units, Mar 94.

28. FONECON between MAJ Anzalone of FUSSPRINT Study Team, CAA, and LTC Moran, 22d Signal Bde., subject: 22d unit stationing considerations, Mar 94.

29. FONECON between MAJ Anzalone of FUSSPRINT Study Team, CAA, and MAJ Flynn, 69th ADA Bde., subject: 69th unit stationing considerations, Mar 94.

30. FONECON between MAJ Anzalone of FUSSPRINT Study Team, CAA, and LTC Andreasan, V Corps Artillery, subject: V Corps Artillery unit stationing considerations, Mar 94.

31. FONECON between MAJ Anzalone of FUSSPRINT Study Team, CAA, and MAJ Cronin, 32d AADCOM, subject: 32d AADCOM unit stationing considerations, Mar 94.

32. FONECON between MAJ Anzalone of FUSSPRINT Study Team, CAA, and LTC Tupper, V Corps, subject: V Corps unit stationing considerations, Mar 94.

MISCELLANEOUS

33 . Bradley, Stephen P., Arnoldo C. Hax, and Thomas L. Magnanti. Applied Mathematical Programming. Reading, MA: Addison-Wesley, 1977.

34. ReVelle, Charles. "Facility Siting and Integer-Friendly Programming." European Journal of Operations Research, 65 (1993).

35. Nemhauser, George L., Laurence A. Wolsey. Integer and Combinatorial Optimization. New York: John Wiley and Sons, 1988.

36. IBM Corporation. Optimization Subroutine Library. New York: IBM Printing Office, 1990.

37. Savelsbergh, Martin W.P., George L. Nemhauser. "Functional Description of MINTO, a Mixed INTeger Optimizer." Georgia Institute of Technology, 1994.

38. CPLEX Optimization Inc. Using the CPLEX Optimizer. Incline Village, NV: CPLEX Optimization Inc.Printing Office, 1990.

APPENDIX D

BIBLIOGRAPHY

DEPARTMENT OF THE ARMY

Department of the Army (DA) Publications

DA Pamphlet 600-19, Quality of Life Program Evaluation

US Army Europe (USAREUR) and 7th ArmyPublications

USAREUR Quality of Life Standards

USAREUR Army Stationing and Installation Plan (ASIP)

USAREUR Pamphlet 405-45, USAREUR Installations

USAREUR Regulation 405-15, Facilities Utilization Management

USAREUR Space and Planning Criteria Manual

MISCELLANEOUS

Williams, H.P. Model Building in Mathematical Programming. New York: John Wiley and Sons, 1978.

APPENDIX E

SOLUTION REPORTS

E-1. SOLUTION SORTED BY UIC. This report is sorted on the Unit Identification Code (UIC) column. Start with a known UIC. The UNIT # is an index used by the study team. The Management Decision Package (MDEP) and End State Management Decision Package (ES-MDEP) columns give current and future program control information. Unit Designation is abbreviated UNTDS. The End State Military Community (ES-MILCOM) column is the location that DCSOPS CFE proposes for that unit. BSB# is an index used by the study team. The Base Support Battalion (BSB) Column is the location generated by the FUSSPRINT methodology.

UNIT#	UIC	MDEPNAME	ES-MDEPNAM	BRNCH	UNTDS	ES-MILCOM	BSB#	BSB
2	WA00AA	V CPS ARTY	V CPS ARTY	FA	HHB CPS BDE	DARMSTADT	2	DARMSTADT
36	WA0AAA	7 ENGR BDE	3 ID ENG BDE	EN	BN CBT CPS MECH	BAMBERG	17	NUERNBERG
45	WA0TAA	V CPS ARTY	V CPS ARTY	FA	HHB CORPS ARTY	HEIDELBERG	23	PIRMASENS
19	WA1YAA	7 CPS ARTY	3 ID DIVARTY	FA	BN (8INSP)	BAMBERG	17	NUERNBERG
51	WA4MAA	22 SIG BDE	22 SIG BDE	SC	BN AREA (MSE)	DARMSTADT	13	MAINZ
64	WA5UAA	1 PERSCOM	1 PERSCOM	AG	DET BAND MACOM	HEIDELBERG	25	WUERZBURG
68	WA5VAA	21 TAACOM	21 TAACOM	AG	DET BAND	K-TOWN	22	KAISERSLAUTERN
75	WA80AA	3 INF DIV	3 ID TROOPS	CM	CO NBC DEF DIV	WURZBURG	16	BAMBERG
86	WA8RAA	8 INF DIV	1 AD TROOPS	CM	CO NBC DEF DIV	HANAU	2	DARMSTADT
88	WAAFAA	11 AVN BDE	12 AVN BDE	AV	HHC CPS AVN BDE	ANSBACH	15	ANSBACH
96	WAC4AA	1 AR DIV	3 ID 3 BDE	IN	BN (M2A2)	VILSECK	20	VILSECK
98	WAC6AA	1 AR DIV	3 ID 3 BDE	AR	BN (M1A1)	VILSECK	20	VILSECK
99	WAC8AA	1 AR DIV	130 ENGR BDE	EN	BN DIV	BAMBERG	24	SCHWEINFURT
105	WACVAA	1 AR DIV	3 ID 3 BDE	AR	HHC BDE	VILSECK	17	NUERNBERG
114	WAD9AA	3 ARMOR DIV	1 AD 1 BDE	AR	BN (M1A1)	GIESSEN	13	MAINZ
118	WADKAA	1 AR DIV	18 MP BDE	MP	CO DIV	ANSBACH	25	WUERZBURG
32	WADLAA	1 AR DIV	3 ID 4 BDE	AV	BN ATK AH64	ANSBACH	15	ANSBACH
128	WAE3AA	3 ARMOR DIV	1 AD 1 BDE	IN	BN (M2A2)	GIESSEN	9	GIESSEN
133	WAELAA	3 ARMOR DIV	1 AD 1 BDE	AR	HHC BDE	GIESSEN	11	BAUMHOLDER
146	WAEQAA	3 ARMOR DIV	1 AD DIVARTY	FA	BN (155SP)	GIESSEN	23	PIRMASENS
152	WAETAA	3 ARMOR DIV	1 AD TROOPS	AR	SQDN DIVCAV M3	HANAU	2	DARMSTADT
153	WAEUAA	3 ARMOR DIV	1 AD ENG BDE	EN	BN DIV	GIESSEN	10	HANAU
156	WAF6AA	1 AR DIV	3 ID DIVARTY	FA	BN (155SP)	BAMBERG	24	SCHWEINFURT
163	WAFDAA	3 ARMOR DIV	1 AD 4 BDE	AV	BN ATK AH64	HANAU	10	HANAU
170	WAFXAA	1 AR DIV	3 ID 3 BDE	AR	BN (M1A1HA)	VILSECK	25	WUERZBURG
177	WAKRAA	V CPS ARTY	V CPS ARTY	FA	BN MLRS	DARMSTADT	13	MAINZ
180	WAM0AA	3 INF DIV	3 ID DIVARTY	FA	BN (155SP)	SCHWEINFURT	24	SCHWEINFURT
183	WAM3AA	3 INF DIV	3 ID 1 BDE	IN	BN (M2A2)	SCHWEINFURT	24	SCHWEINFURT
185	WAM4AA	3 INF DIV	3 ID 1 BDE	IN	BN (M2A2)	SCHWEINFURT	25	WUERZBURG
188	WAM8AA	3 INF DIV	3 ID 1 BDE	AR	BN (M1A1)	SCHWEINFURT	24	SCHWEINFURT
191	WAMHAA	3 INF DIV	3 ID HQ	IN	HHC DIV	WURZBURG	25	WUERZBURG
193	WAMJAA	3 INF DIV	3 ID TROOPS	MP	CO DIV	WURZBURG	16	BAMBERG
195	WAMLAA	3 INF DIV	3 ID 1 BDE	IN	HHC BDE	SCHWEINFURT	16	BAMBERG
50	WAMPAA	3 INF DIV	3 ID DIVARTY	FA	HHB DIVARTY	BAMBERG	16	BAMBERG
201	WAMQAA	3 INF DIV	3 ID DISCOM	CS	HHC DISCOM/MMC	WURZBURG	25	WUERZBURG
204	WAMVAA	3 INF DIV	3 ID TROOPS	AR	SQDN DIVCAV	SCHWEINFURT	25	WUERZBURG
205	WAMZAA	3 INF DIV	3 ID ENG BDE	EN	BN DIV	SCHWEINFURT	25	WUERZBURG
206	WANBAA	3 INF DIV	3 ID TROOPS	SC	BN DIV MSE	WURZBURG	17	NUERNBERG
209	WAPBAA	8 INF DIV	1 AD HQ	IN	HHC DIV	BAD KREUZNAC	12	BAD KREUZNACH
211	WAPCAA	8 INF DIV	1 AD TROOPS	MP	CO DIV	BAD KREUZNAC	13	MAINZ
214	WAPEAA	8 INF DIV	1 AD TROOPS	SC	BN DIV (MSE)	BAD KREUZNAC	11	BAUMHOLDER
217	WAPGAA	8 INF DIV	1 AD 2 BDE	IN	HHC BDE	BAUMHOLDER	13	MAINZ
221	WAPKAA	8 INF DIV	1 AD DIVARTY	FA	HHB DIVARTY	BAUMHOLDER	9	GIESSEN
224	WAPLAA	8 INF DIV	1 AD DISCOM	CS	HHC DISCOM/MMC	BAD KREUZNAC	11	BAUMHOLDER
225	WAPSAA	8 INF DIV	1 AD 2 BDE	IN	BN (M2A2)	BAUMHOLDER	11	BAUMHOLDER
228	WAPWAA	8 INF DIV	1 AD 2 BDE	IN	BN (M2A2)	BAUMHOLDER	2	DARMSTADT
230	WAPYAA	8 INF DIV	1 AD 2 BDE	AR	BN (M1A1HA)	BAUMHOLDER	11	BAUMHOLDER
4	WAT6AA	V CORPS	V CORPS	HQ	HHC CORPS	HEIDELBERG	5	HEIDELBERG
168	WATLAA	HQ USAREUR	HQ USAREUR	nil	HQUSAREUR TATOE	HEIDELBERG	5	HEIDELBERG
23	WAVNAA	32 AADCOM	69 ADA BDE	AD	HHB EAC BDE	WURZBURG	16	BAMBERG
26	WAVPAA	32 AADCOM	32 AADCOM	AD	HHB EAC BDE	K-TOWN	11	BAUMHOLDER
58	WB0HAA	29 ASG	29 ASG	CS	HHD BN MAINT	MANNHEIM	22	KAISERSLAUTERN
59	WB0MAA	3 SPT CMD	3 COSCOM	CS	HHD BN MAINT	HANAU	10	HANAU
70	WB0RAA	2 SPT CMD	3 COSCOM	CS	HHD BN MAINT	NURNBERG	17	NUERNBERG

UNIT#	UIC	MDEPNAME	ES-MDEPNAM	BRNCH	UNTDS	ES-MILCOM	BSB#	BSB
71	WB0UAA	3 SPT CMD	3 COSCOM	CS	HHD BN MAINT	HANAU	2	DARMSTADT
74	WB11AA	59 ORD BDE	191 ORD BN	OD	CO AMMO DS/GS	K-TOWN	22	KAISERSLAUTERN
80	WB1EAA	3 SPT CMD	3 COSCOM	OD	CO AMMO DS/GS	DARMSTADT	10	HANAU
85	WB1MAA	32 AADCOM	32 AADCOM	OD	CO GS MSL MAINT	K-TOWN	12	BAD KREUZNACH
90	WB1XAA	29 ASG	29 ASG	CS	CO MAINT NONDIV	K-TOWN	22	KAISERSLAUTERN
101	WB35AA	3 SPT CMD	3 COSCOM	CS	CO MAINT NONDIV	DARMSTADT	2	DARMSTADT
103	WB38AA	29 ASG	29 ASG	CS	CO MAINT NONDIV	MANNHEIM	6	KARLSRUHE
108	WB3TAA	60 ORD GP	3 COSCOM	OD	CO AMMO DS/GS	K-TOWN	22	KAISERSLAUTERN
116	WB4SAA	2 SPT CMD	3 COSCOM	CS	CO MAINT NONDIV	WURZBURG	25	WUERZBURG
117	WB4TAA	3 SPT CMD	3 COSCOM	CS	CO MAINT NONDIV	HANAU	9	GIESSEN
120	WB54AA	60 ORD GP	191 ORD BN	OD	DET EOD TEAM	GRAFENWOEHR	18	GRAFENWOEHR
132	WB5KAA	2 SPT CMD	3 COSCOM	OD	CO AMMO DS/GS	VILSECK	17	NUERNBERG
139	WB5ZAA	3 SPT CMD	3 COSCOM	OD	DET ATE REPAIR	HANAU	10	HANAU
143	WB6CAA	60 ORD GP	191 ORD BN	OD	DET EOD TEAM	K-TOWN	12	BAD KREUZNACH
154	WB8EAA	60 ORD GP	191 ORD BN	OD	DET EOD CONTROL	MANNHEIM	6	KARLSRUHE
166	WBBHAA	7 ENGR BDE	130 ENGR BDE	EN	CO ASLT FLT BRG	KARLSRUHE	10	HANAU
172	WBBZAA	7 ENGR BDE	130 ENGR BDE	EN	CO CBT SPT EQPT	GRAFENWOEHR	18	GRAFENWOEHR
174	WBCRAA	7 ENGR BDE	130 ENGR BDE	EN	CO MDM GRDR BRG	KARLSRUHE	9	GIESSEN
187	WBG0AA	3 SPT CMD	3 COSCOM	LG	HHC COSCOM	WIESBADEN	2	DARMSTADT
190	WBG7AA	2 SPT CMD	7 MEDCOM	MD	HHD CPS MED GP	HEIDELBERG	5	HEIDELBERG
194	WBGBAA	266 TFC	266 TFC	FI	SPT UNIT TYPE D	HEIDELBERG	25	WUERZBURG
234	WBGJAA	V CPS FIN GP	266 TFC	FI	SPT UNIT TYPE E	HANAU	9	GIESSEN
7	WBGTAA	7 CPS FIN GP	266 TFC	FI	SPT UNIT TYPE E	WURZBURG	16	BAMBERG
10	WBH5AA	3 SPT CMD	3 COSCOM	MD	HSP EVACUATION	MANNHEIM	22	KAISERSLAUTERN
12	WBHEAA	3 SPT CMD	3 COSCOM	MD	HHD CPS MED GP	WIESBADEN	2	DARMSTADT
16	WBJ7AA	7 MEDCOM	7 MEDCOM	MD	HSP GENERAL	K-TOWN	22	KAISERSLAUTERN
18	WBJBAA	7 MEDCOM	7 MEDCOM	MD	HSP EVACUATION	WURZBURG	25	WUERZBURG
60	WBJHAA	7 MEDCOM	7 MEDCOM	MD	HSP CBT SPT	HEIDELBERG	5	HEIDELBERG
111	WBKQAA	7 MEDCOM	3 COSCOM	MD	HOSP MOB SURG	K-TOWN	12	BAD KREUZNACH
56	WBM1AA	7 MEDCOM	7 MEDCOM	MD	BN EVAC	WIESBADEN	10	HANAU
61	WBMPAA	7 MEDCOM	7 MEDCOM	MD	DET MED LAB	K-TOWN	11	BAUMHOLDER
62	WBMYAA	7 MEDCOM	3 COSCOM	MD	UNIT MEDSOM	PIRMASENS	12	BAD KREUZNACH
63	WBMZAA	7 MEDCOM	7 MEDCOM	MD	CO AIR AMB	ANSBACH	15	ANSBACH
67	WBNBAA	7 MEDCOM	7 MEDCOM	MD	UNIT MEDSOM	PIRMASENS	12	BAD KREUZNACH
69	WBNGAA	3 SPT CMD	3 COSCOM	MD	CO AMBULANCE	WIESBADEN	10	HANAU
82	WBP6AA	7 MEDCOM (DE	7 MEDCOM (DE	MD	TM NEURO	K-TOWN	12	BAD KREUZNACH
31	WBQJAA	7 MEDCOM	7 MEDCOM	MD	DET SAN TM	WIESBADEN	10	HANAU
33	WBQQAA	7 MEDCOM (DE	7 MEDCOM (DE	MD	DET PROSTHO	K-TOWN	12	BAD KREUZNACH
104	WBR0AA	7 MEDCOM (DE	7 MEDCOM (DE	MD	DET DENTAL SVC	MANNHEIM	2	DARMSTADT
91	WBR5AA	7 MEDCOM (DE	7 MEDCOM (DE	MD	DET DENTAL SVC	HANAU	4	WIESBADEN
89	WBR6AA	7 MEDCOM (DE	7 MEDCOM (DE	MD	DET DENTAL SVC	WURZBURG	24	SCHWEINFURT
124	WBSDAA	7 MEDCOM (DE	7 MEDCOM (DE	MD	DET DENTAL SVC	K-TOWN	12	BAD KREUZNACH
131	WBSXAA	7 MEDCOM	7 MEDCOM	MD	CO AIR AMB	WIESBADEN	4	WIESBADEN
22	WBSYAA	7 MEDCOM	7 MEDCOM	MD	DET CBT STR CTR	K-TOWN	12	BAD KREUZNACH
134	WBT3AA	7 MEDCOM	7 MEDCOM	MD	DET VET SVC	K-TOWN	11	BAUMHOLDER
136	WBT8AA	7 MEDCOM	7 MEDCOM	MD	DET VET SVC	NURNBERG	17	NUERNBERG
25	WBTHAA	7 MEDCOM	7 MEDCOM	MD	TM HEAD & NECK	K-TOWN	12	BAD KREUZNACH
29	WBTJAA	7 MEDCOM	7 MEDCOM	MD	INFECTIOUS DISE	K-TOWN	12	BAD KREUZNACH
138	WBTWAA	7 MEDCOM	7 MEDCOM	MD	DET VET SVC	K-TOWN	12	BAD KREUZNACH
145	WBUJAA	7 MEDCOM	7 MEDCOM	MD	DET VET SVC	HEIDELBERG	25	WUERZBURG
148	WBUKAA	7 MEDCOM	7 MEDCOM	MD	DET VET SVC	HANAU	2	DARMSTADT
155	WBVCAA	205 MI BDE	205 MI BDE	MI	BN AERIAL EXPL	WIESBADEN	14	AUGSBURG
158	WBVHAA	205 MI BDE	205 MI BDE	MI	BN CEWI TE CPS	DARMSTADT	25	WUERZBURG
169	WBX7AA	7 ATC	18 MP BDE	MP	CO CBT SPT	GRAFENWOEHR	17	NUERNBERG
19	WBXBAA	18 MP BDE	18 MP BDE	MP	HHD BN	MANNHEIM	2	DARMSTADT
179	WBXEAA	14 MP BDE	18 MP BDE	MP	HHD BN	NURNBERG	17	NUERNBERG
203	WBXTAA	14 MP BDE	18 MP BDE	MP	CO CBT SPT	WURZBURG	16	BAMBERG
207	WBXXAA	26 SPT GP	14 MP BDE	MP	CO CBT SPT	HEIDELBERG	22	KAISERSLAUTERN
210	WBYEAA	14 MP BDE	14 MP BDE	MP	CO CBT SPT	STUTTGART	14	AUGSBURG
213	WBYGAA	21 TAACOM	14 MP BDE	MP	CO GUARD	MANNHEIM	2	DARMSTADT
216	WC0GAA	21 TAACOM	21 TAACOM	LG	HHC TAACOM	K-TOWN	22	KAISERSLAUTERN
223	WC1DAA	37 TRANS GP	37 TRANSCOM	TC	DET TRLR X-FER	MANNHEIM	2	DARMSTADT

UNIT#	UIC	MDEPNAME	ES-MDEPNAM	BRNCH	UNTDS	ES-MILCOM	BSB#	BSB
229	WC25AA	14 MP BDE	18 MP BDE	MP	CO CBT SPT	BAMBERG	16	BAMBERG
232	WC2FAA	21 TAACOM	14 MP BDE	MP	CO CBT SPT	MANNHEIM	23	PIRMASENS
233	WC3EAA	12 AVN BDE	12 AVN BDE	AV	CO C ASLT HEL	WURZBURG	25	WUERZBURG
2	WC5LAA	11 AVN BDE	12 AVN BDE	AV	CO A MDM HEL	WURZBURG	25	WUERZBURG
113	WC67AA	32 AADCOM	32 AADCOM	SC	CO DS EAC ADA	K-TOWN	12	BAD KREUZNACH
6	WC9GAA	3 SPT CMD	3 COSCOM	CS	HHC CPS SPT GP	HANAU	2	DARMSTADT
202	WC9HAA	7 MEDCOM (DE	7 MEDCOM (DE	MD	BN DENTAL SVC	HEIDELBERG	25	WUERZBURG
66	WCCMAA	29 ASG	29 ASG	QM	DET AIRDROP SPT	K-TOWN	22	KAISERSLAUTERN
73	WCDWAA	22 SIG BDE	22 SIG BDE	SC	HHC CPS BDE MSE	DARMSTADT	10	HANAU
77	WCEJAA	22 SIG BDE	22 SIG BDE	SC	BN AREA (MSE)	DARMSTADT	10	HANAU
79	WCENAA	22 SIG BDE	22 SIG BDE	SC	BN AREA (MSE)	WURZBURG	25	WUERZBURG
81	WCJZAA	37 TRANS GP	37 TRANSCOM	TC	HHD TRANS GRP	K-TOWN	11	BAUMHOLDER
83	WCK0AA	21 TAACOM	37 TRANSCOM	TC	HHC TRAN BN AVI	MANNHEIM	2	DARMSTADT
87	WCK2AA	2 SPT CMD	3 COSCOM	AV	BN AVIM	ANSBACH	15	ANSBACH
94	WCKMAA	200 TAMMC	1 TMCA	TC	HHD BN MVMT CON	HANAU	9	GIESSEN
95	WCKNAA	37 TRANS GP	37 TRANSCOM	TC	HHD TRANS BN	MANNHEIM	6	KARLSRUHE
97	WCKSAA	200 TAMMC	1 TMCA	TC	HHD BN MVMT CON	K-TOWN	11	BAUMHOLDER
102	WCKXAA	3 SPT CMD	3 COSCOM	TC	HHD TRANS BN	MANNHEIM	2	DARMSTADT
106	WCM9AA	26 SPT GP	26 SPT GP	TC	CO LT-MDM TRUCK	HEIDELBERG	25	WUERZBURG
107	WCMBAA	3 COSCOM	3 COSCOM	TC	CO HVY TRUCK	MANNHEIM	6	KARLSRUHE
110	WCN4AA	37 TRANS GP	37 TRANSCOM	TC	CO MDM TRK	MAINZ	13	MAINZ
112	WCN9AA	37 TRANS GP	37 TRANSCOM	TC	CO MDM TRK	MANNHEIM	6	KARLSRUHE
115	WCNBAA	2 SPT CMD	3 COSCOM	TC	CO MDM TRK POL	MANNHEIM	6	KARLSRUHE
123	WCNTAA	3 SPT CMD	3 COSCOM	TC	CO MDM TRK	MANNHEIM	5	HEIDELBERG
126	WCNXAA	37 TRANS GP	37 TRANSCOM	TC	CO MDM TRK	K-TOWN	22	KAISERSLAUTERN
127	WCNZAA	37 TRANS GP	37 TRANSCOM	TC	CO MDM TRK	MANNHEIM	6	KARLSRUHE
129	WCPJAA	37 TRANS GP	37 TRANSCOM	TC	CO MDM TRK	MANNHEIM	6	KARLSRUHE
130	WCPPAA	3 SPT CMD	3 COSCOM	TC	CTR MVMT CTRL	WIESBADEN	10	HANAU
141	WCT5AA	42 MP GP	14 MP BDE	MP	CO ESCORT GUARD	MANNHEIM	7	MANNHEIM
151	WCYPAA	12 AVN BDE	12 AVN BDE	AV	HHC CPS BDE	WIESBADEN	4	WIESBADEN
157	WD2UA0	32 AADCOM	32 AADCOM	AD	BTY PATRIOT	K-TOWN	12	BAD KREUZNACH
160	WD2UB0	32 AADCOM	32 AADCOM	AD	BTY PATRIOT	K-TOWN	22	KAISERSLAUTERN
162	WD2UC0	32 AADCOM	32 AADCOM	AD	BTY PATRIOT	K-TOWN	22	KAISERSLAUTERN
165	WD2UT0	32 AADCOM	32 AADCOM	AD	HHB PATRIOT BN	K-TOWN	12	BAD KREUZNACH
173	WD5PAA	18 MP BDE	18 MP BDE	MP	CO CBT SPT	HANAU	9	GIESSEN
175	WD64AA	7 MEDCOM	7 MEDCOM	MD	CO AIR AMB	K-TOWN	22	KAISERSLAUTERN
28	WDATAA	7 MEDCOM	7 MEDCOM	MD	TM EYE SURG	NURNBERG	17	NUERNBERG
182	WDC2AA	21 TAACOM	14 MP BDE	MP	HHD BN	MANNHEIM	6	KARLSRUHE
184	WDCQAA	29 ASG	29 ASG	CS	CO SUPPLY DS	MANNHEIM	22	KAISERSLAUTERN
192	WDEPAA	32 AADCOM	32 AADCOM	CS	CO PATRIOT MNT	K-TOWN	22	KAISERSLAUTERN
198	WDH4AA	3 INF DIV	3 ID TROOPS	AG	DET BAND DIV	BAMBERG	17	NUERNBERG
200	WDHZAA	8 INF DIV	1 AD TROOPS	AG	DET BAND DIV	BAD KREUZNAC	9	GIESSEN
37	WDJ0A0	8 INF DIV	1 AD DISCOM	CS	CO A DIV MSB	BAD KREUZNAC	11	BAUMHOLDER
38	WDJ0B0	8 INF DIV	1 AD DISCOM	CS	CO B DIV MSB	BAD KREUZNAC	11	BAUMHOLDER
40	WDJ0C0	8 INF DIV	1 AD DISCOM	CS	CO C DIV MSB	BAUMHOLDER	9	GIESSEN
41	WDJ0D0	8 INF DIV	1 AD DISCOM	CS	CO D DIV MSB	BAUMHOLDER	23	PIRMASENS
42	WDJ0E0	8 INF DIV	1 AD DISCOM	CS	CO E DIV MSB	MAINZ	12	BAD KREUZNACH
43	WDJ0F0	8 INF DIV	1 AD DISCOM	CS	CO F DIV MSB	BAD KREUZNAC	11	BAUMHOLDER
35	WDJ0T0	8 INF DIV	1 AD DISCOM	CS	HHD DIV MSB	BAD KREUZNAC	11	BAUMHOLDER
30	WDJUAA	3 ARMOR DIV	1 AD 4 BDE	AR	HHC DIV AVN BDE	HANAU	10	HANAU
24	WDJVAA	1 AR DIV	3 ID 4 BDE	AR	HHC DIV AVN BDE	ANSBACH	15	ANSBACH
215	WDJYAA	3 INF DIV	3 ID DISCOM	CS	BN MAIN SPT	WURZBURG	20	VILSECK
47	WDKWAA	3 INF DIV	3 ID ENG BDE	EN	HHC DIV BDE	BAMBERG	16	BAMBERG
14	WDKXAA	8 INF DIV	1 AD ENG BDE	EN	BN DIV	BAUMHOLDER	10	HANAU
48	WDKYAA	8 INF DIV	1 AD ENG BDE	EN	HHC DIV BDE	BAD KREUZNAC	11	BAUMHOLDER
219	WDM2AA	21 TAACOM	14 MP BDE	MP	CO CBT SPT	K-TOWN	22	KAISERSLAUTERN
227	WDP9AA	26 SPT GP	26 SPT GP	CS	HHC CPS SPT GP	HEIDELBERG	22	KAISERSLAUTERN
231	WDR3AA	7 CPS PER GP	1 PERSCOM	AG	CO PER SVC	NURNBERG	18	GRAFENWOEHR
235	WDU9AA	26 SPT GP	26 SPT GP	AV	CO CMD ACFT	HEIDELBERG	5	HEIDELBERG
1	WDUVAA	3 ARMOR DIV	1 AD 4 BDE	AV	CO G CMD AVN	HANAU	10	HANAU
3	WDYFAA	1 AR DIV	3 ID 4 BDE	AV	CO G CMD AVN	ANSBACH	15	ANSBACH
8	WE2QAA	18 MP BDE	18 MP BDE	MP	CO CBT SPT	BAUMHOLDER	12	BAD KREUZNACH
9	WE7LAA	3 SPT CMD	3 COSCOM	CS	CO MAINT NONDIV	DARMSTADT	2	DARMSTADT
11	WE7PAA	2 SPT CMD	3 COSCOM	CS	CO SUPPLY DS	NURNBERG	17	NUERNBERG
13	WEREAA	1 PERSCOM	1 PERSCOM	AG	CO POSTAL (DS)	K-TOWN	12	BAD KREUZNACH
15	WET5AA	3 SPT CMD	3 COSCOM	OD	CO MISSILE MNT	HANAU	10	HANAU
17	WET9AA	2 SPT CMD	3 COSCOM	CS	CO MAINT NONDIV	NURNBERG	17	NUERNBERG
20	WFAKAA	12 AVN BDE	12 AVN BDE	AV	BN CMD AVN	WIESBADEN	4	WIESBADEN
21	WFAMAA	200 TAMMC	1 TMCA	TC	AGY TRNS MVT CN	K-TOWN	11	BAUMHOLDER
44	WFL0AA	7 CPS PER GP	1 PERSCOM	AG	CO PER SVC	AUGSBURG	15	ANSBACH
46	WFL1AA	V CPS PER GP	1 PERSCOM	AG	CO PER SVC	HANAU	2	DARMSTADT
49	WFL7AA	7 CPS PER GP	1 PERSCOM	AG	CO PER SVC	WURZBURG	25	WUERZBURG
52	WFMVAA	60 ORD GP	191 ORD BN	OD	DET AMMO HNS CN	K-TOWN	11	BAUMHOLDER
53	WFNVAA	1 PERSCOM	14 MP BDE	MP	BN CONFNMT FAC	MANNHEIM	2	DARMSTADT
54	WFPDAA	18 MP BDE	18 MP BDE	MP	CO CBT SPT	WIESBADEN	2	DARMSTADT
55	WFPEAA	18 MP BDE	18 MP BDE	MP	HHC CPS BDE	MANNHEIM	6	KARLSRUHE
121	WFQJAA	32 AADCOM	69 ADA BDE	AD	BN CORPS CHAP	BAMBERG	24	SCHWEINFURT
57	WG1DAA	7 CPS ARTY	V CPS ARTY	FA	BN MLRS	DARMSTADT	2	DARMSTADT
39	WG2VAA	11 AVN BDE	12 AVN BDE	AV	BN ATK AH64	ANSBACH	15	ANSBACH
65	WG5RAA	42 MP GP	14 MP BDE	MP	HHD GRP	MANNHEIM	6	KARLSRUHE
72	WG98AA	V CPS FIN GP	266 TFC	FI	SPT UNIT TYPE B	BAUMHOLDER	22	KAISERSLAUTERN
78	WGM8AA	8 INF DIV	1 AD TROOPS	AD	BN (V/S)	MAINZ	9	GIESSEN
84	WGN3AA	3 SPT CMD	V CORPS	CM	DET NBC ELEM JB	HEIDELBERG	25	WUERZBURG
92	WGQGAA	1 PERSCOM	1 PERSCOM	AG	CO POSTAL (DS)	SCHWEINFURT	16	BAMBERG
93	WGR7AA	266 TFC	266 TFC	FI	CMD THTR FIN	HEIDELBERG	22	KAISERSLAUTERN
100	WH12AA	3 INF DIV	3 ID TROOPS	AD	BN (V/S)	WURZBURG	24	SCHWEINFURT

UNIT#	UIC	MDEPNAME	ES-MDEPNAM	BRNCH	UNTDS	ES-MILCOM	BSB#	BSB
109	WH1LAA	3 SPT CMD	3 COSCOM	CS	CO SUPPLY DS	HANAU	9	GIESSEN
119	WH24AA	3 INF DIV	V CPS ARTY	FA	BTY A TGT ACQ	DARMSTADT	10	HANAU
122	WH25AA	1 AR DIV	3 ID DIVARTY	FA	BTY B TGT ACQ	GRAFENWOEHR	18	GRAFENWOEHR
125	WH28AA	8 INF DIV	1 AD DIVARTY	FA	BN (155SP)	BAUMHOLDER	12	BAD KREUZNACH
135	WH3AAA	8 INF DIV	1 AD DIVARTY	FA	BN (155SP)	BAUMHOLDER	11	BAUMHOLDER
137	WH3FAA	3 SPT CMD	3 COSCOM	CS	CTR MAT MGT MMC	WIESBADEN	2	DARMSTADT
140	WH3GAA	3 SPT CMD	3 COSCOM	SC	DET DATA PROC	WIESBADEN	2	DARMSTADT
142	WH51AA	1 AR DIV	3 ID DISCOM	CS	BN FWDSPT	VILSECK	16	BAMBERG
144	WH54AA	3 ARMOR DIV	1 AD 1 BDE	AR	BN (M1A1HA)	GIESSEN	9	GIESSEN
147	WH5DAA	21 TAACOM	3 COSCOM	IN	HHC AMF(L)	MANNHEIM	22	KAISERSLAUTERN
149	WH5EAA	SETAF	3 COSCOM	CS	ELE NTL SPT	KARLSRUHE	6	KARLSRUHE
150	WH5QAA	8 INF DIV	1 AD DIVARTY	FA	BTY C TGT ACQ	BAUMHOLDER	11	BAUMHOLDER
159	WH6LAA	21 TAACOM	1 PERSCOM	AG	CO PER SVC	MANNHEIM	23	PIRMASENS
161	WH6MAA	21 TAACOM	1 PERSCOM	AG	CO PER SVC	K-TOWN	22	KAISERSLAUTERN
164	WH6NAA	7 MEDCOM	7 MEDCOM	MD	HHC COMMMAND TA	HEIDELBERG	5	HEIDELBERG
167	WH6SAA	1 PERSCOM	1 PERSCOM	AG	PERS CMD (TA)	HEIDELBERG	5	HEIDELBERG
171	WH6TAA	200 TAMMC	200 TAMMC	LG	CTR MAT MGT MMC	K-TOWN	12	BAD KREUZNACH
176	WH6XAA	3 INF DIV	3 ID TROOPS	MI	BN CEWI DIV	WURZBURG	25	WUERZBURG
178	WH6YAA	8 INF DIV	1 AD TROOPS	MI	BN CEWI DIV	BAD KREUZNAC	10	HANAU
181	WH6ZAA	3 SPT CMD	3 COSCOM	CM	CO DECON	VILSECK	17	NUERNBERG
186	WH7MAA	2 SPT CMD	3 COSCOM	CS	HHC CPS SPT GP	NURNBERG	17	NUERNBERG
189	WH87AA	3 INF DIV	3 ID DISCOM	CS	BN FWDSPT	SCHWEINFURT	17	NUERNBERG
197	WH8HAA	205 MI BDE	205 MI BDE	MI	HHD CPS BDE	MANNHEIM	15	ANSBACH
199	WH8KAA	205 MI BDE	205 MI BDE	MI	BN CEWI OP CPS	MANNHEIM	14	AUGSBURG
208	WH96AA	3 ARMOR DIV	1 AD DISCOM	CS	BN FWDSPT	GIESSEN	11	BAUMHOLDER
212	WH98AA	8 INF DIV	1 AD DISCOM	CS	BN FWDSPT	BAUMHOLDER	11	BAUMHOLDER
218	WHDLAA	130 ENGR BDE	130 ENGR BDE	EN	HHC CPS BDE	HANAU	10	HANAU
220	WHFFAA	59 ORD BDE	191 ORD BN	OD	CO MISSILE MNT	K-TOWN	22	KAISERSLAUTERN
222	WHLRAA	7 MEDCOM	7 MEDCOM	MD	UNIT MEDSOM	PIRMASENS	22	KAISERSLAUTERN
226	WHN9AA	ATC EUROPE	12 AVN BDE	AV	CO E ATC	MANNHEIM	7	MANNHEIM
5	WHZ9AA	7 CPS FIN GP	266 TFC	FI	SPT UNIT TYPE D	NURNBERG	17	NUERNBERG
34	WJB2AA	11 AVN BDE	12 AVN BDE	AV	BN ATK AH64	ANSBACH	15	ANSBACH
76	WJCUAA	7 ATC	7 ATC	IN	BN OPFOR	HOHENFELS	19	HOHENFELS

E-2. SOLUTION SORTED BY BSB. This report is sorted on the BSB column. Find the BSB of interest and quickly determine all units proposed for that location by the FUSSPRINT methodology. The UNIT # is an index used by the study team. UIC is an acronym for Unit Identification Code. The Management Decision Package (MDEP) and End State Management Decision Package (ES-MDEP) columns give current and future program control information. Unit Designation is abbreviated UNTDS. The End State Military Community (ES-MILCOM) column is the location that DCSOPS CFE proposes for that unit. BSB# is an index used by the study team. The Base Support Battalion (BSB) Column is the location generated by the FUSSPRINT methodology.

UNIT#	UIC	MDEPNAME	ES-MDEPNAM	BRNCH	UNTDS	ES-MILCOM	BSB#	BSB
03	WDYFAA	1 AR DIV	3 ID 4 BDE	AV	CO G CMD AVN	ANSBACH	15	ANSBACH
24	WDJVAA	1 AR DIV	3 ID 4 BDE	AR	HHC DIV AVN BDE	ANSBACH	15	ANSBACH
32	WADLAA	1 AR DIV	3 ID 4 BDE	AV	BN ATK AH64	ANSBACH	15	ANSBACH
34	WJB2AA	11 AVN BDE	12 AVN BDE	AV	BN ATK AH64	ANSBACH	15	ANSBACH
39	WG2VAA	11 AVN BDE	12 AVN BDE	AV	BN ATK AH64	ANSBACH	15	ANSBACH
44	WFL0AA	7 CPS PER GP	1 PERSCOM	AG	CO PER SVC	AUGSBURG	15	ANSBACH
63	WBMZAA	7 MEDCOM	7 MEDCOM	MD	CO AIR AMB	ANSBACH	15	ANSBACH
87	WCK2AA	2 SPT CMD	3 COSCOM	AV	BN AVIM	ANSBACH	15	ANSBACH
88	WAAFAA	11 AVN BDE	12 AVN BDE	AV	HHC CPS AVN BDE	ANSBACH	15	ANSBACH
197	WH8HAA	205 MI BDE	205 MI BDE	MI	HHD CPS BDE	MANNHEIM	15	ANSBACH
155	WBVCAA	205 MI BDE	205 MI BDE	MI	BN AERIAL EXPL	WIESBADEN	14	AUGSBURG
199	WH8KAA	205 MI BDE	205 MI BDE	MI	BN CEWI OP CPS	MANNHEIM	14	AUGSBURG
210	WBYEAA	14 MP BDE	14 MP BDE	MP	CO CBT SPT	STUTTGART	14	AUGSBURG
8	WE2QAA	18 MP BDE	18 MP BDE	MP	CO CBT SPT	BAUMHOLDER	12	BAD KREUZNACH
13	WEREAA	1 PERSCOM	1 PERSCOM	AG	CO POSTAL (DS)	K-TOWN	12	BAD KREUZNACH
22	WBSYAA	7 MEDCOM	7 MEDCOM	MD	DET CBT STR CTR	K-TOWN	12	BAD KREUZNACH
25	WBTHAA	7 MEDCOM	7 MEDCOM	MD	TM HEAD & NECK	K-TOWN	12	BAD KREUZNACH
29	WBTJAA	7 MEDCOM	7 MEDCOM	MD	INFECTIOUS DISE	K-TOWN	12	BAD KREUZNACH
33	WBQQAA	7 MEDCOM (DE	7 MEDCOM (DE	MD	DET PROSTHO	K-TOWN	12	BAD KREUZNACH
42	WDJ0E0	8 INF DIV	1 AD DISCOM	CS	CO E DIV MSB	MAINZ	12	BAD KREUZNACH
62	WBMYAA	7 MEDCOM	3 COSCOM	MD	UNIT MEDSOM	PIRMASENS	12	BAD KREUZNACH
67	WBNBAA	7 MEDCOM	7 MEDCOM	MD	UNIT MEDSOM	PIRMASENS	12	BAD KREUZNACH
82	WBP6AA	7 MEDCOM (DE	7 MEDCOM (DE	MD	TM NEURO	K-TOWN	12	BAD KREUZNACH
85	WB1MAA	32 AADCOM	32 AADCOM	OD	CO GS MSL MAINT	K-TOWN	12	BAD KREUZNACH
111	WBKQAA	7 MEDCOM	3 COSCOM	MD	HOSP MOB SURG	K-TOWN	12	BAD KREUZNACH
113	WC67AA	32 AADCOM	32 AADCOM	SC	CO DS EAC ADA	K-TOWN	12	BAD KREUZNACH
124	WBSDAA	7 MEDCOM (DE	7 MEDCOM (DE	MD	DET DENTAL SVC	K-TOWN	12	BAD KREUZNACH
125	WH28AA	8 INF DIV	1 AD DIVARTY	FA	BN (155SP)	BAUMHOLDER	12	BAD KREUZNACH
138	WBTWAA	7 MEDCOM	7 MEDCOM	MD	DET VET SVC	K-TOWN	12	BAD KREUZNACH
143	WB6CAA	60 ORD GP	191 ORD BN	OD	DET EOD TEAM	K-TOWN	12	BAD KREUZNACH
157	WD2UA0	32 AADCOM	32 AADCOM	AD	BTY PATRIOT	K-TOWN	12	BAD KREUZNACH
165	WD2UT0	32 AADCOM	32 AADCOM	AD	HHB PATRIOT BN	K-TOWN	12	BAD KREUZNACH
171	WH6TAA	200 TAMMC	200 TAMMC	LG	CTR MAT MGT MMC	K-TOWN	12	BAD KREUZNACH
209	WAPBAA	8 INF DIV	1 AD HQ	IN	HHC DIV	BAD KREUZNAC	12	BAD KREUZNACH
7	WBGTAA	7 CPS FIN GP	266 TFC	FI	SPT UNIT TYPE E	WURZBURG	16	BAMBERG
23	WAVNAA	32 AADCOM	69 ADA BDE	AD	HHB EAC BDE	WURZBURG	16	BAMBERG
47	WDKWAA	3 INF DIV	3 ID ENG BDE	EN	HHC DIV BDE	BAMBERG	16	BAMBERG
50	WAMPAA	3 INF DIV	3 ID DIVARTY	FA	HHB DIVARTY	BAMBERG	16	BAMBERG
75	WA80AA	3 INF DIV	3 ID TROOPS	CM	CO NBC DEF DIV	WURZBURG	16	BAMBERG
92	WGQGAA	1 PERSCOM	1 PERSCOM	AG	CO POSTAL (DS)	SCHWEINFURT	16	BAMBERG
142	WH51AA	1 AR DIV	3 ID DISCOM	CS	BN FWDSPT	VILSECK	16	BAMBERG
193	WAMJAA	3 INF DIV	3 ID TROOPS	MP	CO DIV	WURZBURG	16	BAMBERG
195	WAMLAA	3 INF DIV	3 ID 1 BDE	IN	HHC BDE	SCHWEINFURT	16	BAMBERG
203	WBXTAA	14 MP BDE	18 MP BDE	MP	CO CBT SPT	WURZBURG	16	BAMBERG
229	WC25AA	14 MP BDE	18 MP BDE	MP	CO CBT SPT	BAMBERG	16	BAMBERG
21	WFAMAA	200 TAMMC	1 TMCA	TC	AGY TRNS MVT CN	K-TOWN	11	BAUMHOLDER
26	WAVPAA	32 AADCOM	32 AADCOM	AD	HHB EAC BDE	K-TOWN	11	BAUMHOLDER
35	WDJ0T0	8 INF DIV	1 AD DISCOM	CS	HHD DIV MSB	BAD KREUZNAC	11	BAUMHOLDER
37	WDJ0A0	8 INF DIV	1 AD DISCOM	CS	CO A DIV MSB	BAD KREUZNAC	11	BAUMHOLDER
38	WDJ0B0	8 INF DIV	1 AD DISCOM	CS	CO B DIV MSB	BAD KREUZNAC	11	BAUMHOLDER
43	WDJ0F0	8 INF DIV	1 AD DISCOM	CS	CO F DIV MSB	BAD KREUZNAC	11	BAUMHOLDER
48	WDKYAA	8 INF DIV	1 AD ENG BDE	EN	HHC DIV BDE	BAD KREUZNAC	11	BAUMHOLDER
52	WFMVAA	60 ORD GP	191 ORD BN	OD	DET AMMO HNS CN	K-TOWN	11	BAUMHOLDER
61	WBMPAA	7 MEDCOM	7 MEDCOM	MD	DET MED LAB	K-TOWN	11	BAUMHOLDER

UNIT#	UIC	MDEPNAME	ES-MDEPNAM	BRNCH	UNTDS	ES-MILCOM	BSB#	BSB
81	WCJZAA	37 TRANS GP	37 TRANSCOM	TC	HHD TRANS GRP	K-TOWN	11	BAUMHOLDER
97	WCKSAA	200 TAMMC	1 TMCA	TC	HHD BN MVMT CON	K-TOWN	11	BAUMHOLDER
133	WAELAA	3 ARMOR DIV	1 AD 1 BDE	AR	HHC BDE	GIESSEN	11	BAUMHOLDER
134	WBT3AA	7 MEDCOM	7 MEDCOM	MD	DET VET SVC	K-TOWN	11	BAUMHOLDER
135	WH3AAA	8 INF DIV	1 AD DIVARTY	FA	BN (155SP)	BAUMHOLDER	11	BAUMHOLDER
150	WH5QAA	8 INF DIV	1 AD DIVARTY	FA	BTY C TGT ACQ	BAUMHOLDER	11	BAUMHOLDER
208	WH96AA	3 ARMOR DIV	1 AD DISCOM	CS	BN FWDSPT	GIESSEN	11	BAUMHOLDER
212	WH98AA	8 INF DIV	1 AD DISCOM	CS	BN FWDSPT	BAUMHOLDER	11	BAUMHOLDER
214	WAPEAA	8 INF DIV	1 AD TROOPS	SC	BN DIV (MSE)	BAD KREUZNAC	11	BAUMHOLDER
224	WAPLAA	8 INF DIV	1 AD DISCOM	CS	HHC DISCOM/MMC	BAD KREUZNAC	11	BAUMHOLDER
225	WAPSAA	8 INF DIV	1 AD 2 BDE	IN	BN (M2A2)	BAUMHOLDER	11	BAUMHOLDER
230	WAPYAA	8 INF DIV	1 AD 2 BDE	AR	BN (M1A1HA)	BAUMHOLDER	11	BAUMHOLDER
6	WC9GAA	3 SPT CMD	3 COSCOM	CS	HHC CPS SPT GP	HANAU	2	DARMSTADT
9	WE7LAA	3 SPT CMD	3 COSCOM	CS	CO MAINT NONDIV	DARMSTADT	2	DARMSTADT
12	WBHEAA	3 SPT CMD	3 COSCOM	MD	HHD CPS MED GP	WIESBADEN	2	DARMSTADT
27	WA00AA	V CPS ARTY	V CPS ARTY	FA	HHB CPS BDE	DARMSTADT	2	DARMSTADT
46	WFL1AA	V CPS PER GP	1 PERSCOM	AG	CO PER SVC	HANAU	2	DARMSTADT
53	WFNVAA	1 PERSCOM	14 MP BDE	MP	BN CONFNMT FAC	MANNHEIM	2	DARMSTADT
54	WFPDAA	18 MP BDE	18 MP BDE	MP	CO CBT SPT	WIESBADEN	2	DARMSTADT
57	WG1DAA	7 CPS ARTY	V CPS ARTY	FA	BN MLRS	DARMSTADT	2	DARMSTADT
71	WB0UAA	3 SPT CMD	3 COSCOM	CS	HHD BN MAINT	HANAU	2	DARMSTADT
83	WCK0AA	21 TAACOM	37 TRANSCOM	TC	HHC TRAN BN AVI	MANNHEIM	2	DARMSTADT
86	WA8RAA	8 INF DIV	1 AD TROOPS	CM	CO NBC DEF DIV	HANAU	2	DARMSTADT
101	WB35AA	3 SPT CMD	3 COSCOM	CS	CO MAINT NONDIV	DARMSTADT	2	DARMSTADT
102	WCKXAA	3 SPT CMD	3 COSCOM	TC	HHD TRANS BN	MANNHEIM	2	DARMSTADT
104	WBR0AA	7 MEDCOM (DE	7 MEDCOM (DE	MD	DET DENTAL SVC	MANNHEIM	2	DARMSTADT
137	WH3FAA	3 SPT CMD	3 COSCOM	CS	CTR MAT MGT MMC	WIESBADEN	2	DARMSTADT
140	WH3GAA	3 SPT CMD	3 COSCOM	SC	DET DATA PROC	WIESBADEN	2	DARMSTADT
148	WBUKAA	7 MEDCOM	7 MEDCOM	MD	DET VET SVC	HANAU	2	DARMSTADT
152	WAETAA	3 ARMOR DIV	1 AD TROOPS	AR	SQDN DIVCAV M3	HANAU	2	DARMSTADT
187	WBG0AA	3 SPT CMD	3 COSCOM	LG	HHC COSCOM	WIESBADEN	2	DARMSTADT
196	WBXBAA	18 MP BDE	18 MP BDE	MP	HHD BN	MANNHEIM	2	DARMSTADT
213	WBYGAA	21 TAACOM	14 MP BDE	MP	CO GUARD	MANNHEIM	2	DARMSTADT
223	WC1DAA	37 TRANS GP	37 TRANSCOM	TC	DET TRLR X-FER	MANNHEIM	2	DARMSTADT
228	WAPWAA	8 INF DIV	1 AD 2 BDE	IN	BN (M2A2)	BAUMHOLDER	2	DARMSTADT
40	WDJ0C0	8 INF DIV	1 AD DISCOM	CS	CO C DIV MSB	BAUMHOLDER	9	GIESSEN
78	WGM8AA	8 INF DIV	1 AD TROOPS	AD	BN (V/S)	MAINZ	9	GIESSEN
94	WCKMAA	200 TAMMC	1 TMCA	TC	HHD BN MVMT CON	HANAU	9	GIESSEN
109	WH1LAA	3 SPT CMD	3 COSCOM	CS	CO SUPPLY DS	HANAU	9	GIESSEN
117	WB4TAA	3 SPT CMD	3 COSCOM	CS	CO MAINT NONDIV	HANAU	9	GIESSEN
128	WAE3AA	3 ARMOR DIV	1 AD 1 BDE	IN	BN (M2A2)	GIESSEN	9	GIESSEN
144	WH54AA	3 ARMOR DIV	1 AD 1 BDE	AR	BN (M1A1HA)	GIESSEN	9	GIESSEN
173	WD5PAA	18 MP BDE	18 MP BDE	MP	CO CBT SPT	HANAU	9	GIESSEN
174	WBCRAA	7 ENGR BDE	130 ENGR BDE	EN	CO MDM GRDR BRG	KARLSRUHE	9	GIESSEN
200	WDHZAA	8 INF DIV	1 AD TROOPS	AG	DET BAND DIV	BAD KREUZNAC	9	GIESSEN
221	WAPKAA	8 INF DIV	1 AD DIVARTY	FA	HHB DIVARTY	BAUMHOLDER	9	GIESSEN
234	WBGJAA	V CPS FIN GP	266 TFC	FI	SPT UNIT TYPE E	HANAU	9	GIESSEN
120	WB54AA	60 ORD GP	191 ORD BN	OD	DET EOD TEAM	GRAFENWOEHR	18	GRAFENWOEHR
122	WH25AA	1 AR DIV	3 ID DIVARTY	FA	BTY B TGT ACQ	GRAFENWOEHR	18	GRAFENWOEHR
172	WBBZAA	7 ENGR BDE	130 ENGR BDE	EN	CO CBT SPT EQPT	GRAFENWOEHR	18	GRAFENWOEHR
231	WDR3AA	7 CPS PER GP	1 PERSCOM	AG	CO PER SVC	NURNBERG	18	GRAFENWOEHR
1	WDUVAA	3 ARMOR DIV	1 AD 4 BDE	AV	CO G CMD AVN	HANAU	10	HANAU
14	WDKXAA	8 INF DIV	1 AD ENG BDE	EN	BN DIV	BAUMHOLDER	10	HANAU
15	WET5AA	3 SPT CMD	3 COSCOM	OD	CO MISSILE MNT	HANAU	10	HANAU
30	WDJUAA	3 ARMOR DIV	1 AD 4 BDE	AR	HHC DIV AVN BDE	HANAU	10	HANAU
31	WBQJAA	7 MEDCOM	7 MEDCOM	MD	DET SAN TM	WIESBADEN	10	HANAU
56	WBM1AA	7 MEDCOM	7 MEDCOM	MD	BN EVAC	WIESBADEN	10	HANAU
59	WB0MAA	3 SPT CMD	3 COSCOM	CS	HHD BN MAINT	HANAU	10	HANAU
69	WBNGAA	3 SPT CMD	3 COSCOM	MD	CO AMBULANCE	WIESBADEN	10	HANAU
73	WCDWAA	22 SIG BDE	22 SIG BDE	SC	HHC CPS BDE MSE	DARMSTADT	10	HANAU
77	WCEJAA	22 SIG BDE	22 SIG BDE	SC	BN AREA (MSE)	DARMSTADT	10	HANAU
80	WB1EAA	3 SPT CMD	3 COSCOM	OD	CO AMMO DS/GS	DARMSTADT	10	HANAU
119	WH24AA	3 INF DIV	V CPS ARTY	FA	BTY A TGT ACQ	DARMSTADT	10	HANAU
130	WCPPAA	3 SPT CMD	3 COSCOM	TC	CTR MVMT CTRL	WIESBADEN	10	HANAU
139	WB5ZAA	3 SPT CMD	3 COSCOM	OD	DET ATE REPAIR	HANAU	10	HANAU
153	WAEUAA	3 ARMOR DIV	1 AD ENG BDE	EN	BN DIV	GIESSEN	10	HANAU
163	WAFDAA	3 ARMOR DIV	1 AD 4 BDE	AV	BN ATK AH64	HANAU	10	HANAU
166	WBBHAA	7 ENGR BDE	130 ENGR BDE	EN	CO ASLT FLT BRG	KARLSRUHE	10	HANAU
178	WH6YAA	8 INF DIV	1 AD TROOPS	MI	BN CEWI DIV	BAD KREUZNAC	10	HANAU
218	WHDLAA	130 ENGR BDE	130 ENGR BDE	EN	HHC CPS BDE	HANAU	10	HANAU
4	WAT6AA	V CORPS	V CORPS	HQ	HHC CORPS	HEIDELBERG	5	HEIDELBERG
60	WBJHAA	7 MEDCOM	7 MEDCOM	MD	HSP CBT SPT	HEIDELBERG	5	HEIDELBERG
123	WCNTAA	3 SPT CMD	3 COSCOM	TC	CO MDM TRK	MANNHEIM	5	HEIDELBERG
164	WH6NAA	7 MEDCOM	7 MEDCOM	MD	HHC COMMMAND TA	HEIDELBERG	5	HEIDELBERG
167	WH6SAA	1 PERSCOM	1 PERSCOM	AG	PERS CMD (TA)	HEIDELBERG	5	HEIDELBERG
168	WATLAA	HQ USAREUR	HQ USAREUR	nil	HQUSAREUR TATOE	HEIDELBERG	5	HEIDELBERG
190	WBG7AA	2 SPT CMD	7 MEDCOM	MD	HHD CPS MED GP	HEIDELBERG	5	HEIDELBERG
235	WDU9AA	26 SPT GP	26 SPT GP	AV	CO CMD ACFT	HEIDELBERG	5	HEIDELBERG
76	WJCUAA	7 ATC	7 ATC	IN	BN OPFOR	HOHENFELS	19	HOHENFELS
10	WBH5AA	3 SPT CMD	3 COSCOM	MD	HSP EVACUATION	MANNHEIM	22	KAISERSLAUTERN
16	WBJ7AA	7 MEDCOM	7 MEDCOM	MD	HSP GENERAL	K-TOWN	22	KAISERSLAUTERN
58	WB0HAA	29 ASG	29 ASG	CS	HHD BN MAINT	MANNHEIM	22	KAISERSLAUTERN
66	WCCMAA	29 ASG	29 ASG	QM	DET AIRDROP SPT	K-TOWN	22	KAISERSLAUTERN
68	WA5VAA	21 TAACOM	21 TAACOM	AG	DET BAND	K-TOWN	22	KAISERSLAUTERN

1UNIT#	UIC	MDEPNAME	ES-MDEPNAM	BRNCH	UNTDS	ES-MILCOM	BSB#	BSB
72	WG98AA	V CPS FIN GP	266 TFC	FI	SPT UNIT TYPE B	BAUMHOLDER	22	KAISERSLAUTERN
74	WB11AA	59 ORD BDE	191 ORD BN	OD	CO AMMO DS/GS	K-TOWN	22	KAISERSLAUTERN
90	WB1XAA	29 ASG	29 ASG	CS	CO MAINT NONDIV	K-TOWN	22	KAISERSLAUTERN
93	WGR7AA	266 TFC	266 TFC	FI	CMD THTR FIN	HEIDELBERG	22	KAISERSLAUTERN
108	WB3TAA	60 ORD GP	3 COSCOM	OD	CO AMMO DS/GS	K-TOWN	22	KAISERSLAUTERN
126	WCNXAA	37 TRANS GP	37 TRANSCOM	TC	CO MDM TRK	K-TOWN	22	KAISERSLAUTERN
147	WH5DAA	21 TAACOM	3 COSCOM	IN	HHC AMF(L)	MANNHEIM	22	KAISERSLAUTERN
160	WD2UB0	32 AADCOM	32 AADCOM	AD	BTY PATRIOT	K-TOWN	22	KAISERSLAUTERN
161	WH6MAA	21 TAACOM	1 PERSCOM	AG	CO PER SVC	K-TOWN	22	KAISERSLAUTERN
162	WD2UC0	32 AADCOM	32 AADCOM	AD	BTY PATRIOT	K-TOWN	22	KAISERSLAUTERN
175	WD64AA	7 MEDCOM	7 MEDCOM	MD	CO AIR AMB	K-TOWN	22	KAISERSLAUTERN
184	WDCQAA	29 ASG	29 ASG	CS	CO SUPPLY DS	MANNHEIM	22	KAISERSLAUTERN
192	WDEPAA	32 AADCOM	32 AADCOM	CS	CO PATRIOT MNT	K-TOWN	22	KAISERSLAUTERN
207	WBXXAA	26 SPT GP	14 MP BDE	MP	CO CBT SPT	HEIDELBERG	22	KAISERSLAUTERN
216	WC0GAA	21 TAACOM	21 TAACOM	LG	HHC TAACOM	K-TOWN	22	KAISERSLAUTERN
219	WDM2AA	21 TAACOM	14 MP BDE	MP	CO CBT SPT	K-TOWN	22	KAISERSLAUTERN
220	WHFFAA	59 ORD BDE	191 ORD BN	OD	CO MISSILE MNT	K-TOWN	22	KAISERSLAUTERN
222	WHLRAA	7 MEDCOM	7 MEDCOM	MD	UNIT MEDSOM	PIRMASENS	22	KAISERSLAUTERN
227	WDP9AA	26 SPT GP	26 SPT GP	CS	HHC CPS SPT GP	HEIDELBERG	22	KAISERSLAUTERN
55	WFPEAA	18 MP BDE	18 MP BDE	MP	HHC CPS BDE	MANNHEIM	6	KARLSRUHE
65	WG5RAA	42 MP GP	14 MP BDE	MP	HHD GRP	MANNHEIM	6	KARLSRUHE
95	WCKNAA	37 TRANS GP	37 TRANSCOM	TC	HHD TRANS BN	MANNHEIM	6	KARLSRUHE
103	WB38AA	29 ASG	29 ASG	CS	CO MAINT NONDIV	MANNHEIM	6	KARLSRUHE
107	WCMBAA	3 COSCOM	3 COSCOM	TC	CO HVY TRUCK	MANNHEIM	6	KARLSRUHE
112	WCN9AA	37 TRANS GP	37 TRANSCOM	TC	CO MDM TRK	MANNHEIM	6	KARLSRUHE
115	WCNBAA	2 SPT CMD	3 COSCOM	TC	CO MDM TRK POL	MANNHEIM	6	KARLSRUHE
127	WCNZAA	37 TRANS GP	37 TRANSCOM	TC	CO MDM TRK	MANNHEIM	6	KARLSRUHE
129	WCPJAA	37 TRANS GP	37 TRANSCOM	TC	CO MDM TRK	MANNHEIM	6	KARLSRUHE
149	WH5EAA	SETAF	3 COSCOM	CS	ELE NTL SPT	KARLSRUHE	6	KARLSRUHE
154	WB8EAA	60 ORD GP	191 ORD BN	OD	DET EOD CONTROL	MANNHEIM	6	KARLSRUHE
182	WDC2AA	21 TAACOM	14 MP BDE	MP	HHD BN	MANNHEIM	6	KARLSRUHE
51	WA4MAA	22 SIG BDE	22 SIG BDE	SC	BN AREA (MSE)	DARMSTADT	13	MAINZ
110	WCN4AA	37 TRANS GP	37 TRANSCOM	TC	CO MDM TRK	MAINZ	13	MAINZ
114	WAD9AA	3 ARMOR DIV	1 AD 1 BDE	AR	BN (M1A1)	GIESSEN	13	MAINZ
177	WAKRAA	V CPS ARTY	V CPS ARTY	FA	BN MLRS	DARMSTADT	13	MAINZ
211	WAPCAA	8 INF DIV	1 AD TROOPS	MP	CO DIV	BAD KREUZNAC	13	MAINZ
217	WAPGAA	8 INF DIV	1 AD 2 BDE	IN	HHC BDE	BAUMHOLDER	13	MAINZ
141	WCT5AA	42 MP GP	14 MP BDE	MP	CO ESCORT GUARD	MANNHEIM	7	MANNHEIM
226	WHN9AA	ATC EUROPE	12 AVN BDE	AV	CO E ATC	MANNHEIM	7	MANNHEIM
5	WHZ9AA	7 CPS FIN GP	266 TFC	FI	SPT UNIT TYPE D	NURNBERG	17	NUERNBERG
11	WE7PAA	2 SPT CMD	3 COSCOM	CS	CO SUPPLY DS	NURNBERG	17	NUERNBERG
17	WET9AA	2 SPT CMD	3 COSCOM	CS	CO MAINT NONDIV	NURNBERG	17	NUERNBERG
19	WA1YAA	7 CPS ARTY	3 ID DIVARTY	FA	BN (8INSP)	BAMBERG	17	NUERNBERG
28	WDATAA	7 MEDCOM	7 MEDCOM	MD	TM EYE SURG	NURNBERG	17	NUERNBERG
36	WA0AAA	7 ENGR BDE	3 ID ENG BDE	EN	BN CBT CPS MECH	BAMBERG	17	NUERNBERG
70	WB0RAA	2 SPT CMD	3 COSCOM	CS	HHD BN MAINT	NURNBERG	17	NUERNBERG
105	WACVAA	1 AR DIV	3 ID 3 BDE	AR	HHC BDE	VILSECK	17	NUERNBERG
132	WB5KAA	2 SPT CMD	3 COSCOM	OD	CO AMMO DS/GS	VILSECK	17	NUERNBERG
136	WBT8AA	7 MEDCOM	7 MEDCOM	MD	DET VET SVC	NURNBERG	17	NUERNBERG
169	WBX7AA	7 ATC	18 MP BDE	MP	CO CBT SPT	GRAFENWOEHR	17	NUERNBERG
179	WBXEAA	14 MP BDE	18 MP BDE	MP	HHD BN	NURNBERG	17	NUERNBERG
181	WH6ZAA	3 SPT CMD	3 COSCOM	CM	CO DECON	VILSECK	17	NUERNBERG
186	WH7MAA	2 SPT CMD	3 COSCOM	CS	HHC CPS SPT GP	NURNBERG	17	NUERNBERG
189	WH87AA	3 INF DIV	3 ID DISCOM	CS	BN FWDSPT	SCHWEINFURT	17	NUERNBERG
198	WDH4AA	3 INF DIV	3 ID TROOPS	AG	DET BAND DIV	BAMBERG	17	NUERNBERG
206	WANBAA	3 INF DIV	3 ID TROOPS	SC	BN DIV MSE	WURZBURG	17	NUERNBERG
41	WDJ0D0	8 INF DIV	1 AD DISCOM	CS	CO D DIV MSB	BAUMHOLDER	23	PIRMASENS
45	WA0TAA	V CPS ARTY	V CPS ARTY	FA	HHB CORPS ARTY	HEIDELBERG	23	PIRMASENS
146	WAEQAA	3 ARMOR DIV	1 AD DIVARTY	FA	BN (155SP)	GIESSEN	23	PIRMASENS
159	WH6LAA	21 TAACOM	1 PERSCOM	AG	CO PER SVC	MANNHEIM	23	PIRMASENS
232	WC2FAA	21 TAACOM	14 MP BDE	MP	CO CBT SPT	MANNHEIM	23	PIRMASENS
89	WBR6AA	7 MEDCOM (DE	7 MEDCOM (DE	MD	DET DENTAL SVC	WURZBURG	24	SCHWEINFURT
99	WAC8AA	1 AR DIV	130 ENGR BDE	EN	BN DIV	BAMBERG	24	SCHWEINFURT
100	WH12AA	3 INF DIV	3 ID TROOPS	AD	BN (V/S)	WURZBURG	24	SCHWEINFURT
121	WFQJAA	32 AADCOM	69 ADA BDE	AD	BN CORPS CHAP	BAMBERG	24	SCHWEINFURT
156	WAF6AA	1 AR DIV	3 ID DIVARTY	FA	BN (155SP)	BAMBERG	24	SCHWEINFURT
180	WAM0AA	3 INF DIV	3 ID DIVARTY	FA	BN (155SP)	SCHWEINFURT	24	SCHWEINFURT
183	WAM3AA	3 INF DIV	3 ID 1 BDE	IN	BN (M2A2)	SCHWEINFURT	24	SCHWEINFURT
188	WAM8AA	3 INF DIV	3 ID 1 BDE	AR	BN (M1A1)	SCHWEINFURT	24	SCHWEINFURT
96	WAC4AA	1 AR DIV	3 ID 3 BDE	IN	BN (M2A2)	VILSECK	20	VILSECK
98	WAC6AA	1 AR DIV	3 ID 3 BDE	AR	BN (M1A1)	VILSECK	20	VILSECK
215	WDJYAA	3 INF DIV	3 ID DISCOM	CS	BN MAIN SPT	WURZBURG	20	VILSECK
20	WFAKAA	12 AVN BDE	12 AVN BDE	AV	BN CMD AVN	WIESBADEN	4	WIESBADEN
91	WBR5AA	7 MEDCOM (DE	7 MEDCOM (DE	MD	DET DENTAL SVC	HANAU	4	WIESBADEN
131	WBSXAA	7 MEDCOM	7 MEDCOM	MD	CO AIR AMB	WIESBADEN	4	WIESBADEN
151	WCYPAA	12 AVN BDE	12 AVN BDE	AV	HHC CPS BDE	WIESBADEN	4	WIESBADEN
2	WC5LAA	11 AVN BDE	12 AVN BDE	AV	CO A MDM HEL	WURZBURG	25	WUERZBURG
18	WBJBAA	7 MEDCOM	7 MEDCOM	MD	HSP EVACUATION	WURZBURG	25	WUERZBURG

1UNIT#	UIC	MDEPNAME	ES-MDEPNAM	BRNCH	UNTDS	ES-MILCOM	BSB#	BSB
049	WFL7AA	7 CPS PER GP	1 PERSCOM	AG	CO PER SVC	WURZBURG	25	WUERZBURG
64	WA5UAA	1 PERSCOM	1 PERSCOM	AG	DET BAND MACOM	HEIDELBERG	25	WUERZBURG
79	WCENAA	22 SIG BDE	22 SIG BDE	SC	BN AREA (MSE)	WURZBURG	25	WUERZBURG
84	WGN3AA	3 SPT CMD	V CORPS	CM	DET NBC ELEM JB	HEIDELBERG	25	WUERZBURG
106	WCM9AA	26 SPT GP	26 SPT GP	TC	CO LT-MDM TRUCK	HEIDELBERG	25	WUERZBURG
116	WB4SAA	2 SPT CMD	3 COSCOM	CS	CO MAINT NONDIV	WURZBURG	25	WUERZBURG
118	WADKAA	1 AR DIV	18 MP BDE	MP	CO DIV	ANSBACH	25	WUERZBURG
145	WBUJAA	7 MEDCOM	7 MEDCOM	MD	DET VET SVC	HEIDELBERG	25	WUERZBURG
158	WBVHAA	205 MI BDE	205 MI BDE	MI	BN CEWI TE CPS	DARMSTADT	25	WUERZBURG
170	WAFXAA	1 AR DIV	3 ID 3 BDE	AR	BN (M1A1HA)	VILSECK	25	WUERZBURG
176	WH6XAA	3 INF DIV	3 ID TROOPS	MI	BN CEWI DIV	WURZBURG	25	WUERZBURG
185	WAM4AA	3 INF DIV	3 ID 1 BDE	IN	BN (M2A2)	SCHWEINFURT	25	WUERZBURG
191	WAMHAA	3 INF DIV	3 ID HQ	IN	HHC DIV	WURZBURG	25	WUERZBURG
194	WBGBAA	266 TFC	266 TFC	FI	SPT UNIT TYPE D	HEIDELBERG	25	WUERZBURG
201	WAMQAA	3 INF DIV	3 ID DISCOM	CS	HHC DISCOM/MMC	WURZBURG	25	WUERZBURG
202	WC9HAA	7 MEDCOM (DE	7 MEDCOM (DE	MD	BN DENTAL SVC	HEIDELBERG	25	WUERZBURG
204	WAMVAA	3 INF DIV	3 ID TROOPS	AR	SQDN DIVCAV	SCHWEINFURT	25	WUERZBURG
205	WAMZAA	3 INF DIV	3 ID ENG BDE	EN	BN DIV	SCHWEINFURT	25	WUERZBURG
233	WC3EAA	12 AVN BDE	12 AVN BDE	AV	CO C ASLT HEL	WURZBURG	25	WUERZBURG

E-3. RESOURCE UTILIZATION BY COMMUNITY. This table gives the percent utilization of each resource by community. The communities listed are those utilized to station the force by the FUSSPRINT methodology. Note the following acronyms: Family Housing (HSG-FA), Administrative Office Space (ADMIN), Dental Clinic Space (DENTAL), Health Clinic Space (HEALTH), Maintenance Space (MAINT), Operations Space (OPNS), Storage Space (STORAGE), Commissary Capacity (COMMISS), Chapel Space (CHAPEL), Aircraft Operations Space (AIRCRAF)

	HSG-FA	ADMIN	DENTAL	HEALTH-	INFRAST	HARDSTA	MAINT	OPNS	STORAGE	COMMISS	CHAPEL	AIRCRAF
DARMSTADT	99.57	43.03	19.76	17.13	46.51	50.14	57.65	43.86	30.00	46.98	46.52	30.44
WIESBADEN	11.61	0.31	2.35	2.97	27.86	30.64	60.72	47.86	10.00	27.90	26.58	84.69
HEIDELBERG	39.50	25.53	6.89	16.94	71.59	67.03	65.97	44.38	0.00	71.43	71.56	51.29
KARLSRUHE	62.72	9.02	5.90	8.46	27.23	32.72	43.75	29.75	0.00	27.25	27.25	0.00
MANNHEIM	4.62	0.00	0.59	0.83	2.86	3.01	1.04	1.59	2.00	2.80	2.86	0.00
GIESSEN	70.91	40.74	7.70	14.07	26.18	28.57	36.61	21.66	16.25	25.93	26.18	0.00
HANAU	99.68	41.41	5.81	10.04	24.03	24.29	16.46	30.00	10.00	23.68	24.03	41.63
BAUMHOLDER	89.14	55.04	12.97	23.59	50.40	62.07	98.89	52.07	25.71	50.38	50.42	0.00
BAD KREUZNACH	90.17	61.17	66.30	43.39	62.42	58.91	37.60	36.81	20.00	62.89	62.44	0.00
MAINZ	98.90	47.13	10.11	10.56	40.06	38.86	19.98	34.53	26.67	40.31	40.07	0.00
AUGSBURG	38.21	97.39	1.91	2.12	20.02	18.50	34.09	23.56	15.00	19.33	20.04	0.00
ANSBACH	79.69	11.76	5.10	7.38	28.83	28.29	73.87	34.80	10.00	28.77	28.84	61.17
BAMBERG	56.25	71.94	7.37	12.12	24.02	28.84	27.58	29.49	10.00	23.04	0.06	0.00
NUERNBERG	96.75	16.33	12.02	19.20	20.59	22.69	22.51	23.41	11.67	20.29	20.61	0.00
GRAFENWOEHR	14.63	74.64	1.95	1.16	16.05	18.48	14.35	9.77	0.00	15.58	16.06	0.00
HOHENFELS	90.73	0.00	2.85	3.98	67.60	58.96	34.67	90.91	20.00	67.71	67.69	0.00
VILSECK	86.39	81.82	12.93	39.77	75.46	79.79	96.88	64.58	50.00	74.92	75.48	0.00
KAISERSLAUTERN	52.36	35.55	17.30	38.85	61.54	60.23	83.05	63.20	6.67	1.78	61.57	100.00
PIRMASENS	99.36	38.55	10.03	3.97	55.48	56.71	98.38	51.86	20.00	56.26	55.51	0.00
SCHWEINFURT	88.50	13.68	25.53	21.33	79.04	73.62	58.97	69.11	47.50	78.70	79.06	0.00
WUERZBURG	99.42	84.49	16.80	38.69	35.67	34.00	29.60	36.89	25.71	35.77	35.66	71.97

E-4. POPULATION BY COMMUNITY, CFE VERSUS CAA. This table is a comparison of the number of personnel stationed in each community by CFE and CAA. End State Force is abbreviated ESF.

CFE	ESF	CAA	ESF
ANSBACH	2241	ANSBACH	2194
AUGSBURG	57	AUGSBURG	882
BAD KREUZNAC	2298	BAD KREUZNACH	2290
BAMBERG	2581	BAMBERG	1680
BAUMHOLDER	4860	BAUMHOLDER	4496
DARMSTADT	3679	DARMSTADT	4204
GIESSEN	3633	GIESSEN	3304
GRAFENWOEHR	448	GRAFENWOEHR	386
HANAU	3150	HANAU	3907
HEIDELBERG	2014	HEIDELBERG	1356
HOHENFELS	648	HOHENFELS	648
K-TOWN	3776	KAISERSLAUTERN	3338
KARLSRUHE	350	KARLSRUHE	1316
MAINZ	969	MAINZ	2019
MANNHEIM	3117	MANNHEIM	213
NURNBERG	968	NUERNBERG	3122
PIRMASENS	212	PIRMASENS	1263
SCHWEINFURT	4634	SCHWEINFURT	4410
STUTTGART	141	STUTTGART	0
VILSECK	2799	VILSECK	2369
WIESBADEN	1825	WIESBADEN	547
WURZBURG	5639	WURZBURG	6095

APPENDIX F

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